

Machine and Tool BLUE BOOK

A HITCHCOCK PUBLICATION

OCTOBER, 1961 • 50 CENTS

Tracing Ain't Dead Yet!

Getting the Most from Jigs with the Right Bushings!

How to Fasten Carbide to Steel Part 4: Shrink Fit Mounting

How Good is a Diamond Wheel for Grinding High-Vanadium Steel?

ALLEN F. BREWER begins this month . . .
LUBRICANTS AND COOLANTS

Will Numerical Control Save You Money?

COMPLETE CONTENTS ON PAGES 3 AND 5

" . . . our ability
to ship between
factories gives us
a better chance
to level off our
production every-
where."

see page 110 for



Manufacture Abroad? . . .
an interview with H. A. WALLACE of
MASSEY-FERGUSON

EXTRAS

on the machine . . . not on the invoice!



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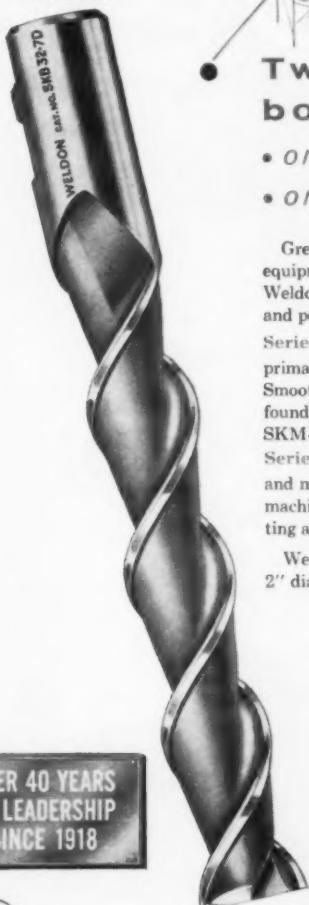
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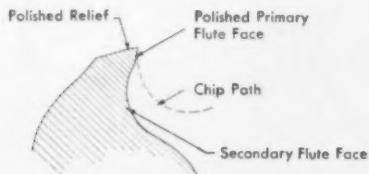
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- one for profile finishing

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October, 1961

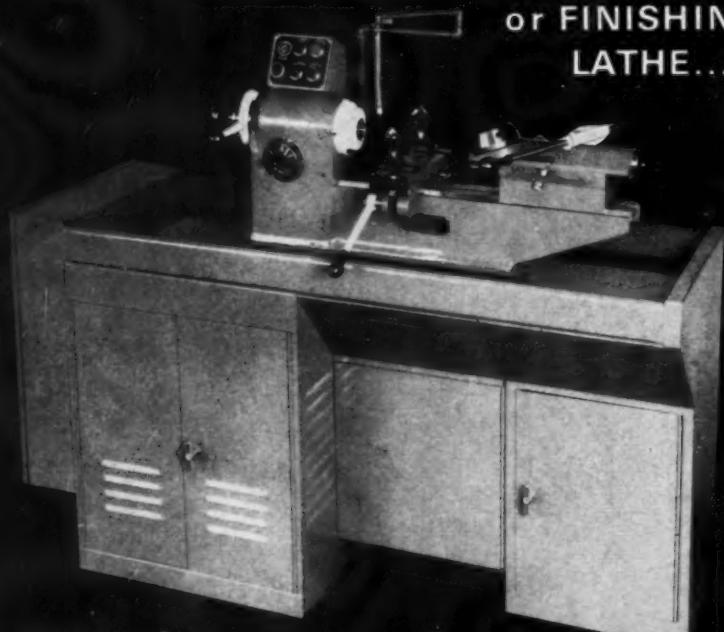
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Vol. 56, No. 10, October, 1961

Machine and Tool BLUE BOOK

for the Men of Action in Metalworking

MANUFACTURE ABROAD? . . . HERE'S HOW MASSEY-FERGUSON DOES IT 110

H. A. Wallace, vice-president, manufacturing, in an interview with BLUE BOOK's editor, explains the advantages of having more than two dozen plants scattered around the world.

DIAMOND WHEELS FOR GRINDING HIGH-VANADIUM STEEL? 115

A diamond wheel costs about 150 times as much as an aluminum-oxide wheel. Here are the results of performance tests which show that diamond wheels can be used more profitably than aluminum-oxide wheels to grind high-vanadium tool steels.

TRACING AIN'T DEAD YET! 120

A description of the newest development in the art of profiling—a tracer system that uses magnetic force to keep the stylus in contact with the template—and how it is being utilized at North American Aviation.

GETTING THE MOST FROM JIGS WITH THE RIGHT BUSHINGS 124

One of the most essential features of a good jig design is the selection of guide bushings. Here's a review of hardened-steel guide bushings and how they are used.

FOR RAPID RETRIEVAL . . . CARD MOUNT MICROFILMED DRAWINGS 128

Wear and tear on engineering drawings and storage space is minimized through the use of microfilm. By mounting the microfilm on cards, the system's usefulness is broadened.

HOW TO FASTEN CARBIDE TO STEEL—PART 4 137

Shrink fit mounting is discussed this month. The author examines where this application should be used and different methods that are possible under several circumstances.

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MACHINE and TOOL BLUE BOOK

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"Will Numerical Control Save You Money?" A superficial comparison of initial investment only is misleading to compare the cost of the electronic equipment to the machine is like comparing the cost of the machine to the cutting tool. Author Childs examines an analysis of two machining methods to prove the point.		
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"Lubricants and the Machine Tool" is the title of Allen Brewer's introductory column on a subject which is so important to efficient metalworking operations.		
CUTTING TOOLS	L. Stoner	141
"Between Carbide and Ceramic" describes titanium carbide, a class of materials that contains no tungsten carbide or cobalt. Lloyd Stoner, now authoring this vital column, cites several examples that demonstrate the versatility of this latest carbide grade.		
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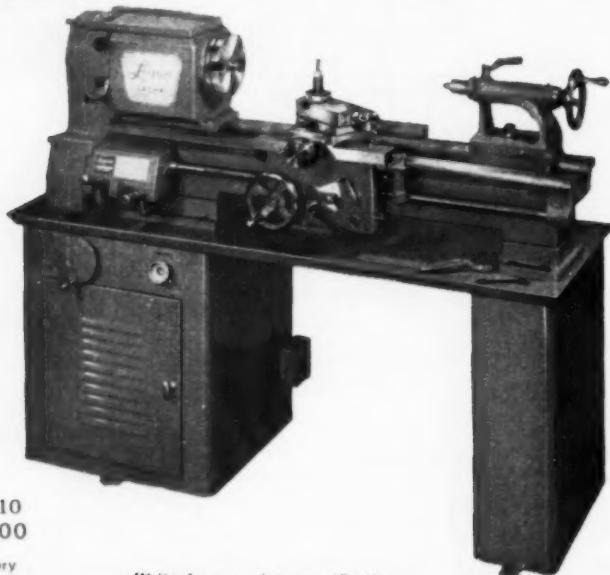
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Accuracy is essential in a lathe. No one denies this. Yet accuracy alone isn't enough. It must be **sustained** accuracy. This requires holding exact tolerances during all machining operations and throughout the lathe's productive life. The new Logan 14" swing lathes deliver this sustained accuracy. For example, these lathes have ball bearing variable speed drive for precise turning speeds. The drive can be adjusted at any time to any rpm (40-1400) while the lathe is running. You **don't** stop to shift belts! Also, the ball bearing spindle's $1\frac{3}{8}$ " bore and $1\frac{1}{8}$ " collet capacity will perform many different jobs. But perhaps your best assurance of Logan accuracy is the thorough testing—from headstock to tailstock—of **every** lathe before shipment. Write for specification—proof that Logan is your best dollar value in the lathe field.

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WITH THE EDITOR :

Co-ops for Our Smaller Fry

A contract-procurement co-operative, the first of its kind in the metalworking industry, purports to equate business opportunities for small- and medium-size machine shops with those for bigger plants.

The organization, Manufacturing & Machining Services Corp. (headquartered in Hillside, N.J.) claims an initial roster of 155 shops, with a goal of 2500 within twelve months. Sales offices already exist in five eastern seaboard cities; others are planned in all major industrial centers. The sales force submits bids on behalf of its members for government work and manufacturer's subcontracts.

A perpetual inventory is kept of all member-shop facilities, as well as a record of the current job loads of each. In this way, time is saved by limiting bidding opportunities to shops having both the necessary equipment and the open time. A minimum of at least three firms have the opportunity to submit sealed bids on each project.

More than just a contract intermediary, MMSC has an ambitious program for its members: technical and engineering assistance and supervision;

a credit checking service; a centralized personal service; financing for handling large contracts; and centralized purchasing. Protecting those who award the contracts are provisions for the careful screening of applicants, guarantees on delivery dates, and the correction or replacement of all rejected work without charge.

Co-ops in other industries have been thriving for years both in America and in Europe, so obviously the concept has its merit. It will be interesting to watch and to study the co-operative movement in our own industry.

This month BLUE BOOK starts an absorbing series on "Lubricants and Coolants." The author, Allen F. Brewer, knows the lubrication field well. He is a licensed professional engineer; for thirty-two years he was the editor of "Lubrication" for the Texas Co. and is the author of the recently published book, "Basic Lubrication Practice."



A. F. BREWER

Edgar Altholz



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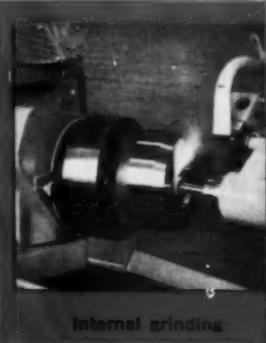
internal grinding

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GIVE YOUR SHOP THE PROGRESSIVE LOOK



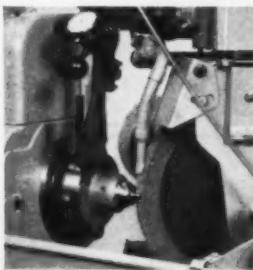
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grinding a shoulder,
wheel and drive interchanged

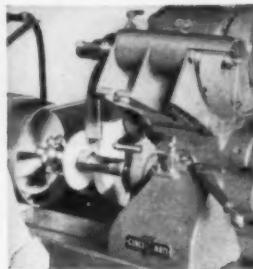


face grinding

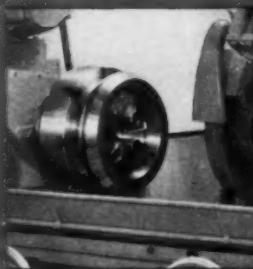
A machine shop is not a show window display, but customers do visit occasionally. Is their reaction to your equipment favorable? Take a good look at your universal grinders, for example. Many of those in use today should be replaced. The best impression will be made by new CINCINNATIS ...because everyone knows that these fine machines produce the highest quality work. And their many fea-

ture-advantages, such as FILMATIC grinding wheel spindle bearings, give you extra values in versatility and dependability.

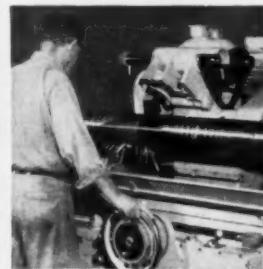
Put new CINCINNATI FILMATIC Universals in your shop, and you'll see a big improvement in customer relations *and* in operating setups like those illustrated here. Want more information? Write or telephone today for catalogs.



infeed grinding a hub



grinding a bevel



traverse grinding large part

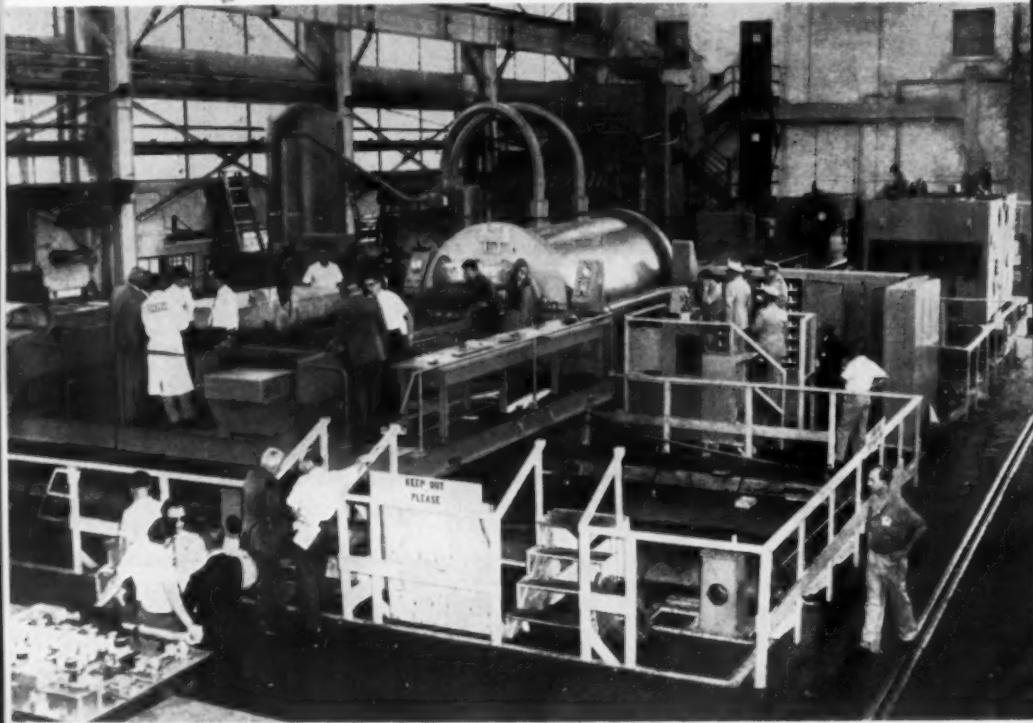
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October, 1961

THIS MONTH in Metalworking



Missile and aircraft frame sections and structural units will be completely shaped by 41,000 tons of available pressure in this direct-acting hydraulic press at Grumman Aircraft Corp.'s Bethpage, N.Y., plant. Billed as the world's most powerful hydraulic press, it is undergoing final testing at the Verson Allsteel Press Co., Chicago.

A laminated cylindrical pressure

vessel capable of withstanding extreme pressures from within provides the main body of the Verson-Wheelon press. A fluid cell mounted in the roof of the pressure cylinder is inflated with hydraulic fluid to provide forming pressure. The pressure is exerted on metal blanks arranged on a tray which has been moved into the bottom area of the pressure cylinder. The



1

Unlocked position •
In this position tools
are inserted or re-
moved.

2



3



Working position •
Tool now securely held
in position—handle
removed.

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EXCLUSIVE TREE FEATURE

The Tree Rapid-Lok is a collet adapter designed to hold end mills, boring bars, and other tooling *accurately, securely and with great rapidity* on both horizontal and vertical mills, jig borers, boring bars and other machines.

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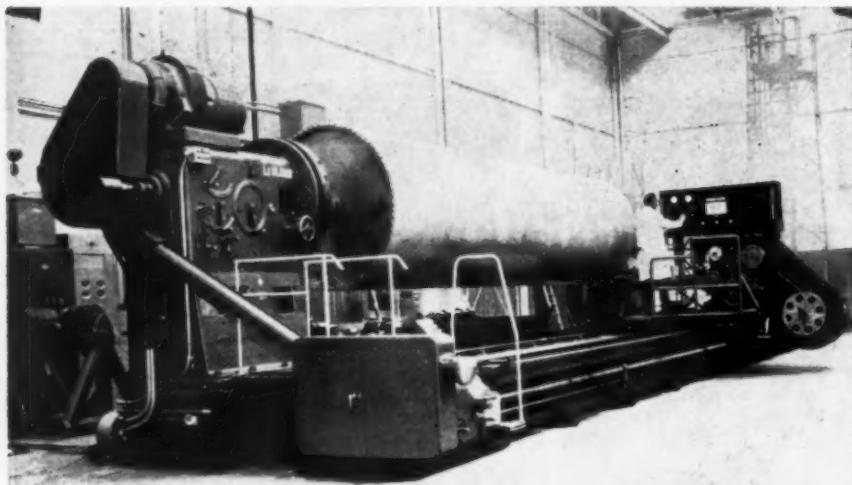
THIS MONTH continued

fluid cell expands to entirely fill the unoccupied area within the cylinder and, as a result, shapes the metal blanks around form blocks upon which the blanks have been arranged.

Four trays are provided. While one tray is within the pressure cylinder, the other three are available for loading or unloading of parts. Two trays are used for forming parts cold, while

the other two trays are provided with heater elements to heat the blanks up to 600°F., as required for the forming of special metals.

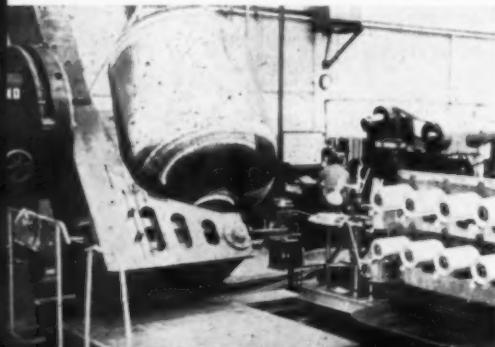
The press is operated from a master control console or from two auxiliary stations with the operators in contact with each other by telephone. From the stations, all trays can be maneuvered in four directions—both in and out of the cylinder and lateral. • • •



Wrapping and bonding metal strips around cylindrical chambers for big rocket engines increases strength-to-weight ratios by as much as 30%

and saves weight. Aerojet-General's Structural Materials Division made this winding machine from a double-bed LeBlond Admiral lathe to wrap workpieces 45' long and 100" in diameter.

The lathe is also used to wrap pressure vessels by a filament winding process, left. The workpieces are tumbled in a special cradle attached to the faceplate of the lathe to achieve an intricate winding pattern. • • •





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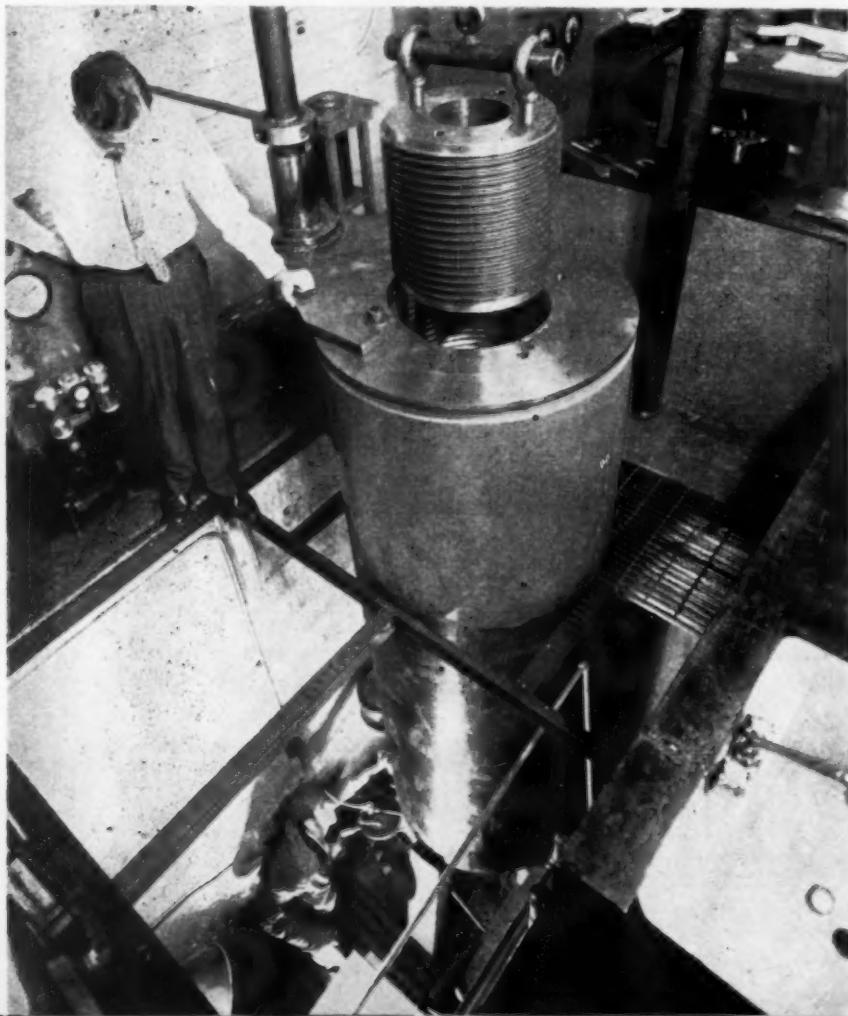
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THIS MONTH continued

King-sized carbide and powdered metal parts, such as long boring bars, steel mill rolls, and nuclear fuel elements, will be shaped in this hydrostatic press at the Carmet Div. plant of Allegheny Ludlum Steel Corp. The press shapes forms up to 5' long and

12" in diameter; it exerts 50,000 psi.

To achieve the desired shape, the powdered metal is tightly packed into rubber molds, then cased in perforated steel tubes which are lowered into the chamber. Pressure is generated in the cylinder by forcing water into the chamber. • • •



Do it for less

ON A GISHOLT BALANCER

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Readings hold until corrections are made.

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Correction planes can be inside or outside work supports.

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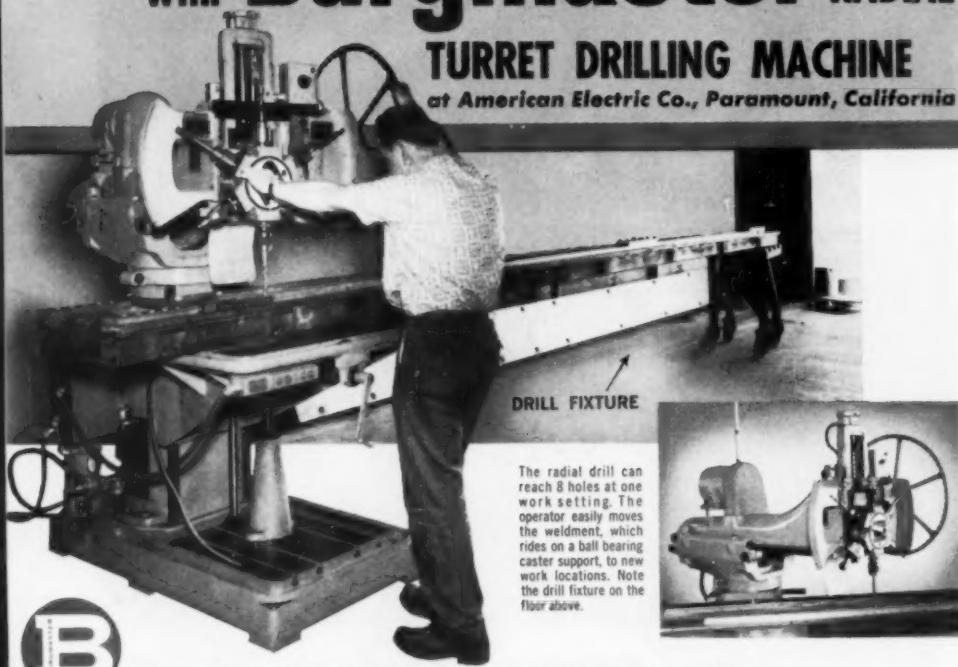
October, 1961

15

300 Operations Performed on 23' 2" Weldment with Burgmaster RADIAL

TURRET DRILLING MACHINE

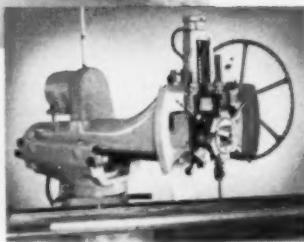
at American Electric Co., Paramount, California



A Burgmaster Radial 6-Spindle Drilling Machine greatly simplified the machining operations on a 23' 2" long, 19" wide x 5" deep welded gear rack assembly weighing 2100 lbs. 300 operations including c'drill, drill, c'bore, tap, ream and core drill are performed on both sides, and center locations were maintained by long, easy-to-handle magnesium drill fixtures with slip bushings. One man produces a part in less than 4 hours, including

DRILL FIXTURE

The radial drill can reach 8 holes at one work setting. The operator easily moves the weldment, which rides on a ball bearing caster support, to new work locations. Note the drill fixture on the floor above.



the doweling operations.

The standard Burgmaster Radial Drill with its long sweep and ability to be moved quickly from one hole location to another solved the problem of handling long work pieces inexpensively. Most important, however, lead time to get into production was reduced to a minimum — just the time to make the drill fixtures — 2 days.

JOB FACTS

Company:
American Electric Co.
Paramount, California

Machines:
Burgmaster 2 BR 6-Spindle Radial Turret Drilling Machine

Part:
Gear Rack Assembly; Lot 400
Material:
1020 Steel — Wt. — 2100 lbs.

Holding:
Rests on table and ball bearing caster support. Uses Drill Fix-

tures with Slip Drill Bushings

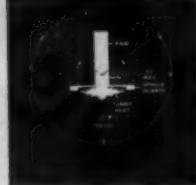
Operations:
300 — C'Drilling, Drilling, C'Boring, Tapping, Reaming, & Core Drilling

Production:

Less than 4 hours

Advantages:

Goes into production at once, inexpensively handles large work, eliminates requirements for special equipment, occupies minimum floor space.



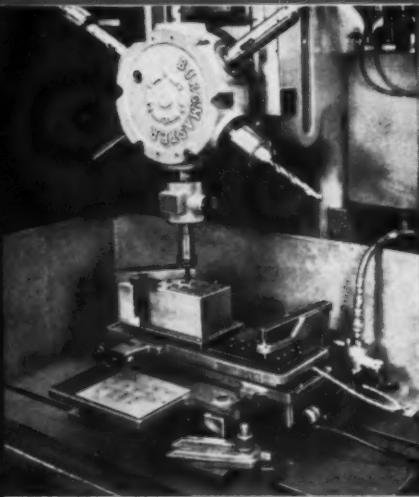
The Burgmaster Radial 6-Spindle Turret Drill has a $\frac{1}{4}$ " drill and tap capacity in steel. The Radial sweep a radius of 14" minimum to 42" maximum through 250° over a 24" F to B by 36" L to R table. The ram rolls on large double row ball bearings and is easily positioned by one hand from the handle on the turret. Releasing thumb button hydraulically clamps all units rigidly in place.

MODERNAIR USES Burgmaster MODEL 2B

TURRET DRILL AND RAPID POSITIONING TABLE

to save 60% Tooling Costs!

at Modernair Corporation, San Leandro, California



BURGMMASTER
Rapid
Positioning
Table
speeds 85 Drill,
Tap and Ream
Operations per Part



Modernair now performs 85 operations in a lot of 2024 aluminum valve bodies with a Burgmaster Model 2B, 6-spindle turret drill equipped with a rapid positioning table. This Burgmaster combination permitted holding fixture costs to be cut from \$266.00 to \$90.00, tooling time from 2 weeks to

2 days, and production time savings of 8 hours of labor per valve body. Ream tolerances were held to a $\pm .0005$ with a RMS-18 finish, and hole locations were held to a $\pm .002$. Another reason you should get the facts on Burgmaster.



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Index 1/4" Capacity



1/8" Manual Power
Index 1/8" Capacity



1/16" Manual Power
Index 1/16" Capacity



2B Ram Type Radial:
Drill 1/4" Capacity



2BH Automatic Hydraulic
1/4" Capacity



3BH Automatic Hydraulic
1/2" Capacity



2BNT Automatic Tape
Controlled 1 1/4" Capacity



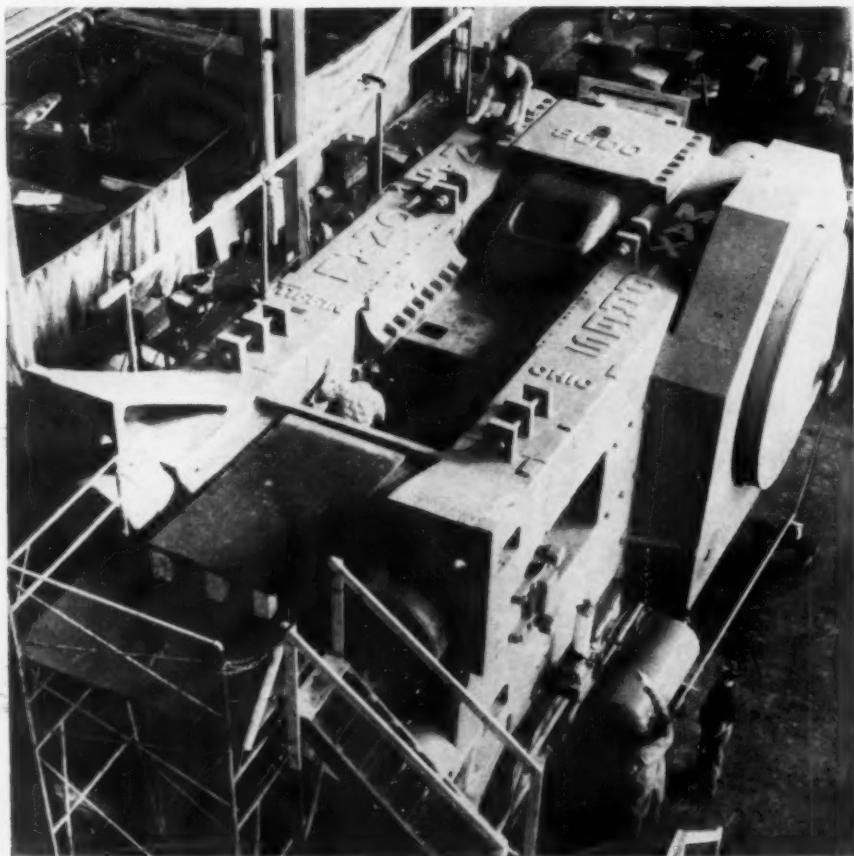
2BNT-BENT Automatic
Tape Controlled
3/4" and 1 1/2" Capacity



Send for
Literature

Write for Bulletins describing
Burgmaster Models 2BR and 2B,
6-Spindle Turret Drilling, Tapping
and Boring Machines. Forty-
minute, 16mm sound film showing
all Burgmaster Turret Drills in
operation is available without
charge from any office.

THIS MONTH continued

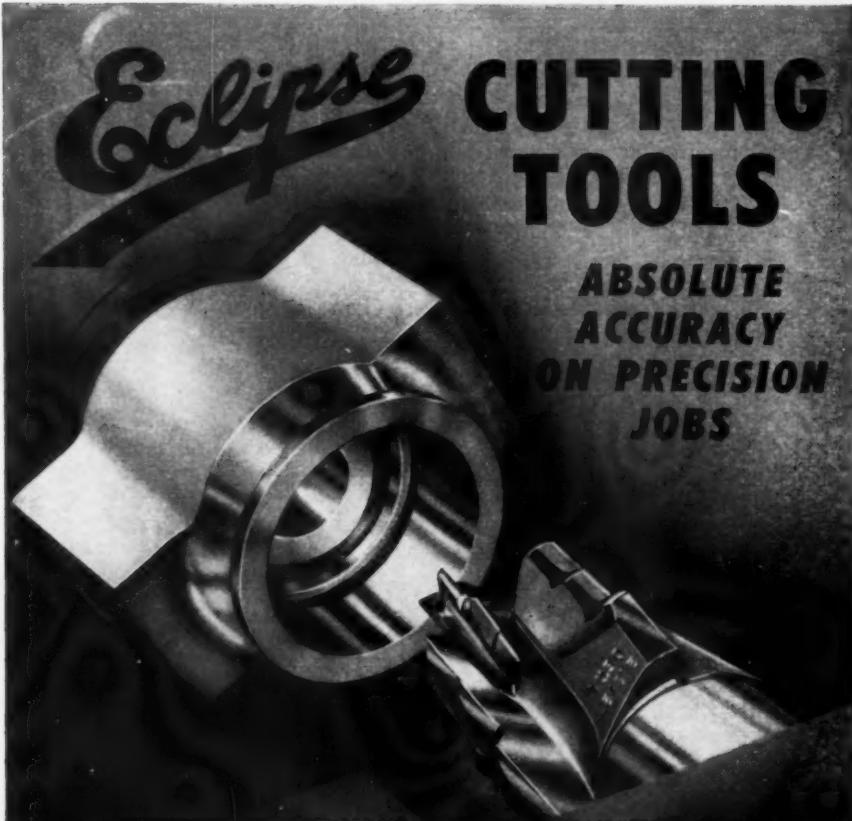


Jet and space programs of the Air Force are requiring bigger and heavier machine tools. This high-speed mechanical press for precision forging is so mammoth that it is being assembled on its back rather than upright in the plant of National Machinery Co., Tiffin, O. When installed at the Jet Div. of Thompson-Ramo-Wooldridge in Cleveland, the 1,400,000-lb. Maxi-press will produce forgings to tolerances of .004"—reportedly the closest

ever achieved in meeting hardware specifications of the Air Force. Its capacity will bring about new production approaches involving the flowing of preheated, higher heat resisting materials. It will also provide a wider latitude in die designing for handling these super materials.

The press runs at 34 strokes per minute and is powered by a 500 hp motor.

• • •



Eclipse

CUTTING TOOLS

**ABSOLUTE
ACCURACY
ON PRECISION
JOBS**

MATERIAL: Extruded aluminum aircraft engine part.
JOB: 10 cutting operations with one tool: 5 boring,
1 trepanning, 2 chamfering and 2 facing.
TOOL: Eclipse multi-diameter; replacing normal
4 tool set up.
RESULT: Absolute accuracy and concentricity.

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THIS MONTH continued

Increasing U. S. production through more efficient assembly line balancing was cited by Chicago scientists, as a means for American industry to meet the growing competition of goods from cheap foreign labor markets.

Addressing a group of manufacturing representatives from top U. S. industries attending seminars on assembly line balancing, Dr. Maurice D. Kilbridge stated that many of today's progressive assembly lines waste from 10% to 25% of the worker's time. Kilbridge is a consultant of the Armour Research Foundation of Illinois Institute of Technology.

Introduced by scientists of the Armour Research Foundation was a new method for balancing assembly lines; one which can be used for practically all types of assembly lines, and can be placed into operation by plant engineers and industrial engineers. Described as the first successful method since 1910 when Henry Ford instituted the first assembly line, the ARF

method cuts down idle workers' time, and consequently cuts direct labor costs involved in manufacturing products.

Key factors in any progressive assembly line hinge on the nature of the work and the timing for each assembly stage. In the new system, all that are required are simple mathematical calculations in order to balance the line, regardless of the complexity of the assembly line.

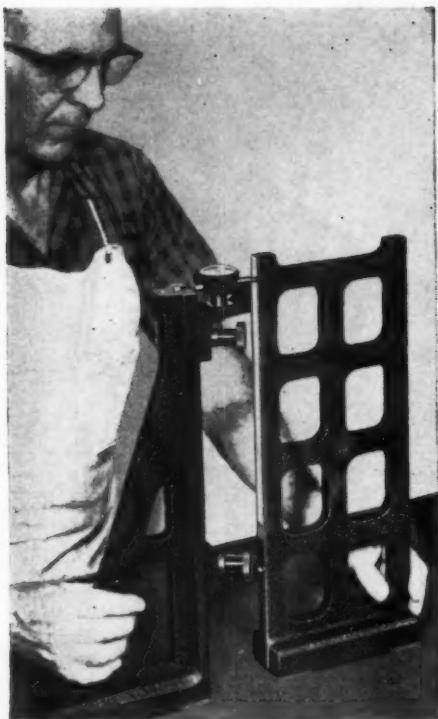
To renovate or rebalance a line, the engineer adds up all assembly-stage working times used to make a total unit. Then he divides this figure by the number of workers. The average is an average cycle time for each station.

Next, he subtracts the actual working time for each operation from the average cycle time. The difference between these figures yields the first clue as to which workers are overloaded. It also helps to pinpoint the slackers.

• • •



Dr. Maurice D. Kilbridge (left), Armour Research Foundation consultant, explains the new method of balancing assembly lines to W. B. Scott, vice president of manufacturing for Motorola, Inc., and D. W. Thomas, manager of industrial engineering for the Ford Motor Co., as Dr. Leon Wester, Foundation researcher (right) looks on. Kilbridge and Wester developed the new system which was introduced to the nation's top industries at Foundation-sponsored seminars on assembly line problems.



FAST, True-Square Setups With The Robbins 90° Indicator Gage!

- Checks squareness instantly
- Registers angular errors to plus or minus .0001"
- Dial indicator for easy, visual measurement
- Designed for toolroom, inspection or production use
- Includes Master Square accurate to .0001"

With the Robbins 90° Indicator Gage, inspection and setups are faster, easier, more accurate. No special skills are needed to use it, no shimming or complicated build-ups are needed to check squareness.

A dial indicator visually reads 90° angles with accuracy to plus or minus .0001" on surfaces from 1½" to 17¾" long. The Robbins Indicator Gage also checks relative position of parts or fixture components, and, when used with Robbins

Magna Sine or non-magnetic Sine Plates, it quickly checks accuracy of angles other than 90 degrees.

The Robbins 90° Indicator Gage is furnished complete with Dial Gage, Master Square accurate to .0001", and fitted hardwood box. Contact your Robbins Representative, or write direct for price and application data on this money-saving shortcut to true-square inspection and machining.

61-2R

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EX-CELL-O
CORPORATION
Greenville Plant, 945 E. Sater St., Greenville, Okla.

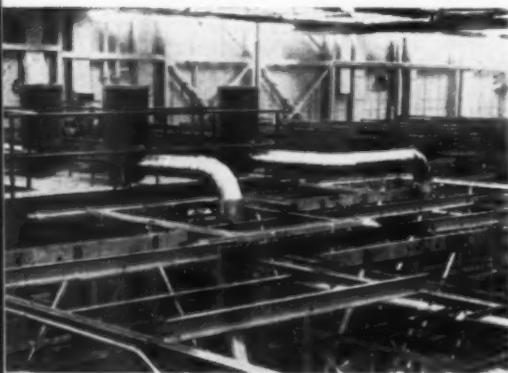
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THIS MONTH continued

A newly installed tube mill, capable of producing more than two million feet of welded tubing per month, is the latest step in a modernization program at the Shapeweld Div., Solar Steel Corp. Capable of continuous operation by use of looping equipment, the Yoder mill can produce 50,000' of tubing per shift in diameters to 2½" and wall thicknesses up to .093". It will produce tubing in finishes suitable for painting or plating. • • •

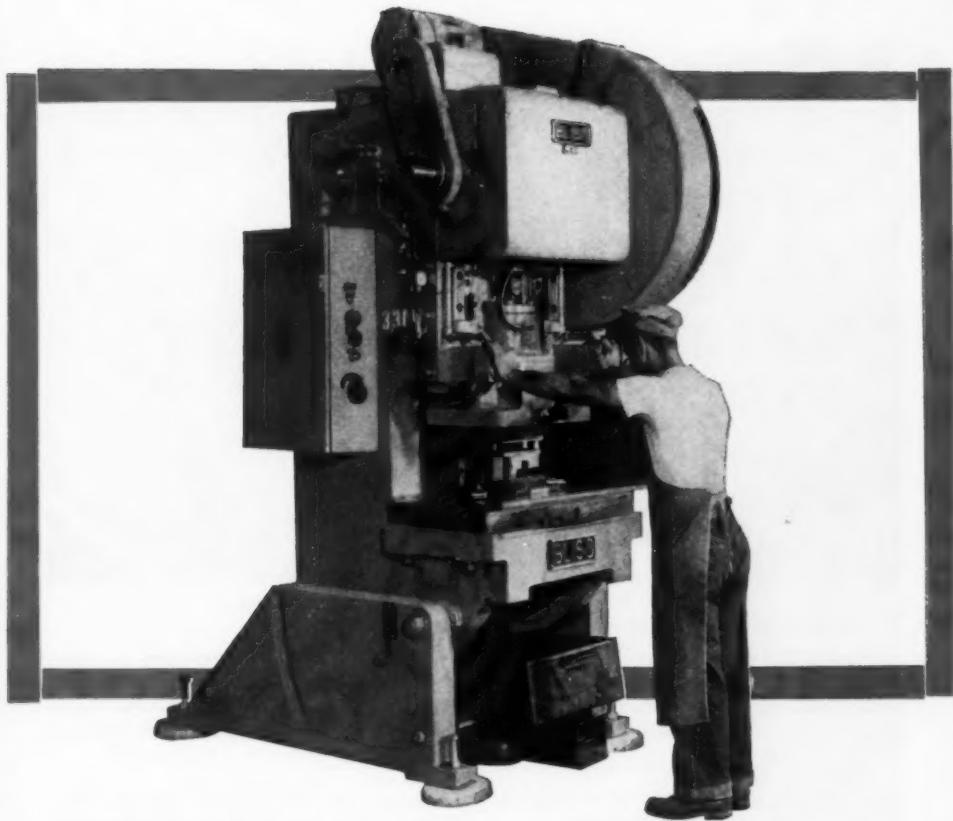
Overhead installation of mist collectors at a major automobile manufacturer's plant permit operation of only those Kingsbury multiple-spacing rotary-type milling machines required at any given time, without operating a massive central system, and also makes it possible to add mist collecting capacity individually as new machine tools are added to the line. Each "Mistkop," made by Aget Mfg. Co., Adrian, Mich., has a capacity of 3600 cfm.

• • •



The point here, gentlemen, is that, like the seamless hose this young lady is modeling on her left leg, stainless steel pails are now being produced free of seams. The new pail is being used widely to transport milk on dairy farms and also is attracting attention in other food handling and hospital uses.

Leyse Aluminum Co., Keweenaw, Wis., produces the pail from Allegheny Ludlum Steel Corp.'s Type 304 stainless steel by flow turning. A low micro finish on the pail's interior eliminates surface roughness on which bacteria may become attached. • • •



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THIS MONTH continued



Futurmill Acquires Detroit Area Plant

Futurmill, Inc., Pontiac, Mich., manufacturer of milling cutters, planer conversion spindles, accessory equipment, and other milling and metal-

removal tools, has purchased a plant at 19720 W. Eight Mile Road, Southfield, Mich. All company operations have been transferred to this larger facility.

McKay Machine Co. to Produce Metal Processing Equipment

The McKay Machine Co., Youngstown, Ohio, has been licensed to manufacture lines of metal processing equipment formerly made by the Wean Equipment Corp., Cleveland, Ohio.

McKay has been sales representative for Wean since early 1960, and will now be in a position to manufacture that equipment as well as its own products and those of its subsidiaries.

business of the Torsion Balance Co., Clifton, N.J., makers of Kentron and Kentrall hardness testers.

These acquisitions now give Riehle a complete line of portable, bench, and floor-mounted hardness testers for Vickers, Rockwell, and Brinell hardness scales, as well as expanding its line of tensile-compression, ductility, and flexure testing machines.

Riehle Buys Testing Line

Riehle Testing Machines Division of American Machine and Metals, Inc., East Moline, Ill., has purchased the Steel City Testing Machines, Inc., Detroit, Mich., and the hardness tester

DeVlieg Continues to Grow

DeVlieg Machine Co., Royal Oak, Mich., announced that it has completed a 20,000 sq. ft. addition to its plant at 14 Mile Road and Fair St. This is three years after building a new 130,000 sq. ft. plant which, at that time, doubled the firm's floor space.

6-12

DE LUXE
SURFACE
GRINDER

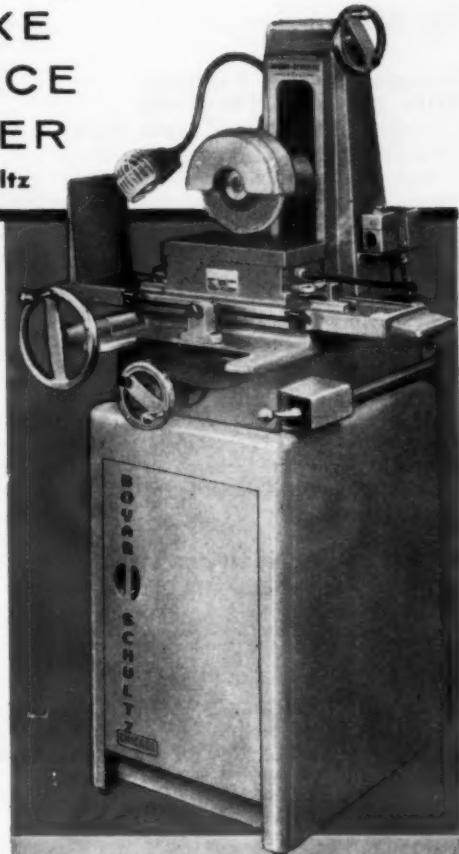
by Boyar-Schultz

A De Luxe Boyar-Schultz Surface Grinder incorporating many new accessories for those who want the ultimate.

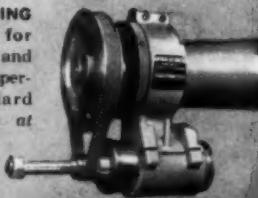
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- MOTORIZED OILING SYSTEM. A lubricating system providing automatic flow of lubrication to all bearing surfaces.
- OIL HARDENED AND GROUND tool steel inserts on longitudinal saddle ways.
- NEW WHEEL GUARD to accommodate an eight inch grinding wheel.
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- NEW HEAVY DUTY BASE with welded structural steel inner frame for maximum rigidity and increased weight. Also available with patented built-in dust collector.

6-12 De Luxe Surface Grinder is available with hand or hydraulic feed.



HIGH SPEED GRINDING ATTACHMENT — for grinding angles and slots too small to permit using standard wheels. Available at additional cost.



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October, 1961

25

THIS MONTH continued

Douglas Orders Profilers With Numerical Controls

Douglas Aircraft Co., Santa Monica, Calif., has announced the placement of orders for eleven numerically-controlled profiling machines costing over \$3 million dollars.

Installation of this equipment in one of the Douglas West Coast plants will provide the largest concentration of such machine tools in the world. There will be seven Giddings & Lewis five-axis profilers, three G & L three-axis Di-Mill profilers, two G & L four-axis vertical turret lathes, and four Sundstrand four-axis Omnimils. All will be equipped with the Bendix Dynapath solid state control system.

ASME Moves Headquarters

The American Society of Mechanical Engineers has moved its headquarters

to the recently completed United Engineering Center in Manhattan. The official address of the Center, which occupies a block on United Nations Plaza, is 345 E. 47th St., New York 17, New York.

Weldon Tool Founder Dies

Carl A. Bergstrom, founder and chairman of the board of The Weldon Tool Co., Cleveland, Ohio, designers and manufacturers of end mills, cutting tools, adapters, and holders, died in Euclid Glenville Hospital, Euclid, Ohio.

Born in Sweden 79 years ago, Mr. Bergstrom came to this country in 1904. He worked for several tool manufacturers before organizing the Weldon Company in 1918. He pioneered the advantages of end mills having fast spiral flutes for freer cutting and developed the Weldon shank for quicker removal from its holder.

Arwood To Open Cleveland Plant

The Arwood Corp., New York, N.Y., will open its sixth investment casting plant in Cleveland, Ohio, early next year. This installation will be a fully integrated foundry, casting ferrous, cobalt, and nickel base alloys by the

solid-mold and ceramic-shell processes. It will have its own tool and die-making, finishing, inspection, and heat-treating facilities.

The building, which is located at 3855 150th St., was acquired by Arwood in 1960 when it took over the assets of Alloy Precision Casting Co.





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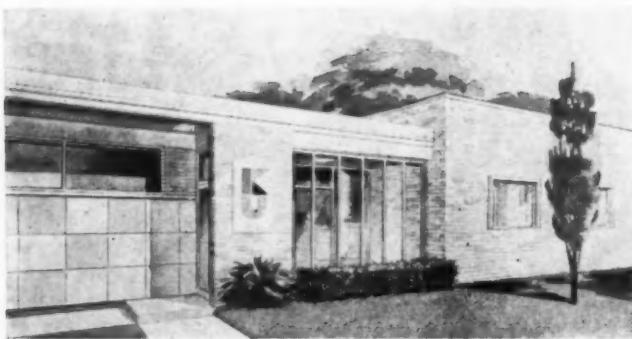
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MM-9

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THIS MONTH continued



Kerns United Corp. Moves to New Offices

Kerns United Corp., manufacturer of specialized industrial lubricants, has moved into its new executive, sales, and general office facility at 824 State

St., Calumet City, Ill. According to B. L. Smalley, president and board chairman, future plans call for the erection of a new manufacturing plant and research and development laboratory facilities in Calumet City.

First 4' Bright Annealing Line Operating at Crucible Plant

Crucible Steel Co. of America, Pittsburgh, Pa., announced that the country's first 48" wide bright annealing line at its Midland, Pa., Works is in operation. Orders for bright annealed stainless up to 48" wide in thicknesses from .010" to .0625" are now being accepted.

Previously, bright annealing lines were capable of handling rather narrow

width strip, such as Crucible's line at its Spaulding Works, Harrison, N.J. The wide line allows narrow automotive trim parts to be blanked across the strip rather than along its length. This allows the fabricator to make production savings. Also, 48" panels for architectural and institutional applications are now available with a bright annealed finish.



W. D. Johnson

W. D. Johnson Forms Die-Casting Firm

William D. Johnson has formed his own die-casting firm, Dycast, Inc. The new company is located at 8051 N. Ridge-way Ave., Skokie, Ill.

His new business will specialize in high finish, precision aluminum die castings, and will offer "a complete engineering service to assist in designing castings," according to the young president.

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Our inspection projector magnifies cutting edges to eliminate the minute angular deflection that could cause you costly production losses . . . just one of many inspections that account for Circle R quality.

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PHOENIX Dielectric Tool Center

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THIS MONTH continued



"The Story of Productivity" Begins Three-Year Tour

Major events that began with the Industrial Revolution and brought man to his present state of material welfare have been compressed into a 46½' long traveling educational exhibit that began a three-year tour of the country in September. It will be shown before engineering societies, civic, management, and educational groups.

The exhibit is the fourth of its type designed by the DoAll Co., Des Plaines, Illinois.

Called "The Story of Productivity", the display is built around a "sunburst" 8' in diameter that records in ten

classifications 157 major events that ushered in man's age of abundance.

On each side of the sunburst are six display panels and tables, and above, life-like busts of great innovators.

The tables contain replicas or models of inventions that made major contributions toward man's progress. They include an 18th century French clock and the machines used to produce its parts, Arkwright's "spinning jenny", a working model of Watt's first steam engine, Morse's telegraph, Bell's telephone, McCormick's reaper, and other inventions.

U.S. Firm Gives Manufacturing Rights to British Company

The Steel Improvement and Forge Co., Cleveland, Ohio, has concluded an agreement with a British machine tool manufacturer, The Birmingham Small Arms Co., Ltd., whereby the latter has been granted the right through its subsidiary, B.S.A. Tools, Ltd., to build and market the American company's electrochemical metalworking machines.

New territories opened up by the contract include the United Kingdom, all member countries of the British

Commonwealth, Belgium, Denmark, Norway, Sweden, Finland, Spain, Portugal, Israel, Eire, the Union of South Africa, and the United Arab Republic.

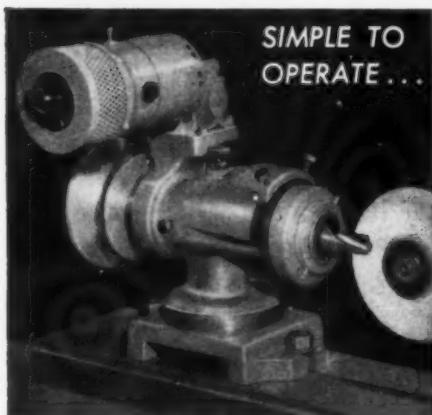
Lakeside Steel Improvement Co. Sold to Lindberg Steel Co.

Lindberg Steel Treating Co., Inc., Melrose Park, Ill., has acquired 100% stock ownership of Lakeside Steel Improvement Co., Cleveland, Ohio. Lindberg plans to operate Lakeside Steel as a wholly-owned subsidiary.

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**SAVE AND
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TWIN FIXTURES TO SHARPEN
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SIMPLE TO
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NO SPECIAL OPERATOR SKILLS
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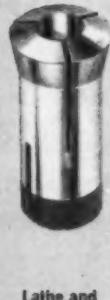
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31

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MODEL D-2 HEAVY-DUTY 2-DIMENSIONAL

Pantograph for milling, drilling and engraving.

Vertical adjustment of copy table automatic with Pantograph. Features: unobstructed on 3 sides to take large work; micrometer adjustment for depth of cut; ball bearing construction throughout; spindle speeds up to 26,000 rpm for engraving or machining; vertical range over 10"; ratios 2 to 1 to infinity — master copy area 26" x 10".

Write or call for full details and prices.



NEW MODEL D2-201 PNEUMATIC ATTACHMENT

for use with Model D2 Pantograph Engraver to rapidly drill holes in printed circuits by tracing templates. Drills as many as 100 holes per minute. Equipped with foot switch; spindle air cylinder; regulating valve and pressure gauge; filter and oiler. It's ready to use as soon as it's attached to an air compressor.

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October, 1961

THIS MONTH continued

Chromalloy and Fansteel Sign Licensing Agreement

Chromalloy Corp., West Nyack, N.Y., and Fansteel Metallurgical Corp., North Chicago, Ill., jointly announced signing a licensing agreement giving Chromalloy the exclusive right to practice the inventions covered by several Fansteel patents. The patents pertain to the coating of refractory metals, molybdenum, tantalum, tungsten, and columbium, whose high temperature oxidation-resistance can be improved by these metallurgical treatments.

Nielsen Saw Opens Factory

Nielsen Saw and Mfg. Co., Eugene, Ore., has opened its factory branch at 2323 Florence St., Cincinnati 6, Ohio. The new branch handles the complete line of Nielsen saw chain grinders, parts, grinding wheels, carbide tipped saws, cutters, routers, and various carbide supplies.

MPB Announces Acquisition Of Wafe Mfg. Co.

The acquisition of Wafe Mfg. Co., Bridgeport, Conn., designers and manufacturers of precision tools and dies, by Miniature Precision Bearings, Inc., Keene, N.H., has been announced by H. D. Gilbert, MPB president. Wafe will now be operated as the Wafe Division of MPB, Inc.

Geoscience Acquires More Space

Geoscience Instruments Corp. is moving to larger facilities at 110 Beekman St., New York 38, N.Y. The new headquarters will accommodate the firm's materials processing laboratory which will fabricate and finish metals, ceramics, and exotic materials. The laboratory is also equipped to do

research work on metals and ceramics.

The company specializes in the materials, equipment, and techniques required in critical surface preparation work, especially polishing.

F. J. Stokes Establishes West Coast Service Facility

F. J. Stokes Corp., Philadelphia, Pa., has opened a West Coast facility at 3761 E. Colorado Blvd., Pasadena, Calif., to provide technical service on its standard items of equipment for vacuum processing, molding, tabletting, and compacting.

F. Theodor Hahn has been appointed district manager of the new facility. Under him as sales engineers are, Albert V. Bicknell, James A. Fox, and John A. Kershaw.

Zeeve Named Machinery Dealers' President

New president of the Machinery Dealers National Assoc. is Alex Zeeve, Jr., president of Alex Zeeve & Co., Inc., New York.

Other officers include: Bedford A. Small of MacDell Corp., first vice-president; Joseph M. O'Connell of O'Connell Machinery Co., Inc., second vice-president; Richard J. Strom of Strom Machinery Corp., treasurer.

Lincoln Opens Office-Warehouse

A combination office-warehouse has been constructed in St. Louis, Mo., by The Lincoln Electric Co., Cleveland, Ohio, manufacturers of welding equipment and supplies. The prefabricated, welded steel structure will house office, demonstration, and warehouse facilities.

The 40' by 122' building has 3,280 sq. ft. of floor space for warehousing. A protected 20' by 20' dock aids movement of shipments into and out of the warehouse.

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October, 1961

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THIS MONTH continued

Two Industrial Firms Announce An International Exchange

A two-way international expansion has been announced by The Ingersoll Milling Machine Co., Rockford, Ill., and H. A. Waldrich GmbH, Siegen, Westfalen, Germany.

The two firms will exchange advanced designs and technical know-how and will build machine tools and production systems of the types in which each has specialized. Ingersoll will build Waldrich heavy-duty lathes and roll grinding machines in this country, while Waldrich will build Ingersoll special machines for the European market.

Narda Ultrasonics Changes Name To Dynasonics Corp.

Narda Ultrasonics Corp., Syosset, N.Y., has changed its name to Dynasonics Corp. as part of a major change in management's policies toward research and product diversification in the field of electro-acoustics.

The firm was formed in 1957 and is a producer of ultrasonic cleaning equipment that provides mass production ultrasonic cleaning, finishing, metal working and chemical processing.

Miniature Instruments Acquires Precision Machining Co.

Miniature Instruments, Inc., Minneapolis, Minn., has acquired the business and equipment of Metalmasters, a Minneapolis company specializing in high precision machining.

Kaydon Plans Improvements

The Kaydon Engineering Corp., Muskegon, Mich., is investing more than one-million dollars in a plant improvement program this year, accord-

ing to Frank J. Donovan, company president.

New improvements include a re-arranging of departments to improve work flow and minimize material handling, a centralizing of operations which are similar, and the purchase of new machines and equipment. This will entail a 15,000 sq. ft. plant addition.

Bellows-Valvair Will Market Berry-Dowty Hydraulic Pumps

Sales and service of Berry-Dowty hydraulic gear pumps and motors will be handled by the Bellows-Valvair Division of International Basic Economy Corp., New York, N.Y.

Under the agreement, Bellows will market Berry-Dowty pumps in the U.S. and Puerto Rico for original equipment manufacturers and for in-plant use in the general industrial field. Berry Hydraulics will continue to market gear pumps and motors to original equipment manufacturers in the mobile and agricultural fields.

South Bend Lathe, Inc., Offers True-Trace Duplicators

South Bend Lathe, Inc., South Bend, Ind., has announced that it is offering a duplicating attachment on its lathes. The duplicating attachment, manufactured by True-Trace Corp., El Monte, Calif., will be supplied as original equipment on South Bend's 10" and 16" lathes. They are hydraulic servo-controlled pivot-type units.

Larger Plant for Metal Masters

Metal Masters Co., designer and builder of special industrial machines and equipment, has moved to larger facilities at 2601 W. Diversey Ave., Chicago, Ill. The new plant contains 8,000 sq. ft. of floor space, more than twice the area of the company's previous building.

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Standard holders
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from stock
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Empire cut-off blades

FASTER CUTTING

Empire (Luers Type) cut-off blades are precision ground on all surfaces to assure sharper, faster cutting edges. Also, because their design requires grinding of front face only when resharpening, cut-off production is consistently increased throughout the long blade life.

COOLER CUTTING

Hollow ground top of Empire blades causes chips to collapse and thus eliminate heat-generating friction on side walls of the cut. Also, by causing chips to collapse, a greater flow of coolant

can reach the blade cutting edges and cooler cutting is obtained.

LONGER CUTTING

Longer blade life on every cut-off job is assured by: finest engineered blade design that precludes excessive friction or heat generation; wide selection of blade materials that permits use of best material for each cut-off job; simplicity of resharpening (only the front face of blade is reground) prevents grinding away blade life.

Widest range of blade materials permits selection of best blade for each cut-off job

Empire Cut-Off Blades are available in the following materials: four grades of H. S. Steel (high-cobalt, high-vanadium); non-magnetic, solid cast-alloy (non-ferrous, cobalt-chromium-tungsten) having high red-hardness and superior abrasion resistance; and four grades of carbide tipped blades.



Made under license issued by John Milton Luers Patents, Inc.

EMPIRE TOOL COMPANY • 11500 LAMBS ROAD • MEMPHIS, MICHIGAN

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THIS MONTH continued

Sunbeam Buys Mern Industries

Sunbeam Equipment Corp., Meadville, Pa., has acquired Mern Industries, Oconomowoc, Wis., manufacturer of heat-treating furnaces and equipment. Purchase included all engineering, patent rights, and plant equipment. The operation will be integrated with the Sunbeam line of furnaces in Meadville.

Former Armco Steel VP Dies

Dr. Anson Hayes, former vice-president in charge of research for Armco Steel Corp., Middletown, Ohio, died

recently at Keokuk County Hospital in Sigourney, Ia.

Dr. Hayes joined Armco as chief chemist in 1928. He became director of research in 1929 and held that post until 1946 when he was elected vice-president. The following year he became a consultant to the company.

Littell Has New Address

F. J. Littell, manufacturer of reels, roll feeds, straighteners, sheeting lines, and coil handling and processing equipment, has changed address to 4101 N. Ravenswood Ave., Chicago 13, Ill.

New Distributors . . .

Eastern

Detroit Broach & Machine Co., Rochester, Mich.

(broaching machines, cutting tools, straightening, forming, riveting, swaging, and assembly presses, and hydraulic tracer conversion unit)

G. W. Brunton & Son, Inc., 2315 Elmwood Ave., Buffalo, N.Y.

Gisholt Machine Co., Madison, Wis.

(manual and automatic turret lathes, single spindle automatic chucking lathes, automatic threading lathes, superfinishers, and balancing machines)

Brown & Zortman Machinery Co., 4 W. Manila Ave., Pittsburgh 20, Pa.
Syracuse Supply Co., Buffalo and Rochester, N.Y.

Midwest

Parker-Hannifin Corp., Cleveland, Ohio

(industrial hose and reusable hose fittings)

Des Plaines Auto Parts Inc., 1765 Busse Highway, Des Plaines, Ill.

Racine Hydraulics & Machinery, Inc., Racine, Wis.

(hydraulic components for industrial uses)

Air Draulics Sales Co., 1390 Briarwood Dr., Memphis, Tenn.

Western

Racine Hydraulics & Machinery, Inc., Racine, Wis.

(hydraulic components for industrial uses)

Electro-Hydraulics Co., 1326 Larimer St., Denver, Col.

Fluid-Air Components, Inc., 8705 S. E. 13th Ave., Portland, Ore.

Jack Ogle & Co., 861 Poplar Place, Seattle, Wash.

The Rains Co., 756 S. 1st St., Salt Lake City, Utah.

R-O Mfg. Co., Madison Heights, Mich.

(universal form relieving equipment, including fixtures, grinder, and comparator)

M. Lovernich & Assoc., Los Alamitos, California.

New *LOW PRICES*...
same high Quality!



Sure / bore

micrometer adjustable

**BORING BAR
CARTRIDGES**

New from Portage Double-Quick . . .
a revised price list on the quality
SURE-BORE line of boring bar car-
tridges and accessories . . . no cut-back
of quality.

New *VERSATILITY*...

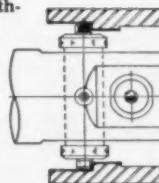
SURE-BORE DOUBLE FEED CARTRIDGES

Doubles boring feeds with-
out increasing tool load.

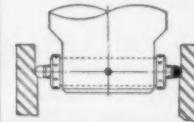


NO OTHER TOOL
can be inserted in a
boring bar as economically
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easily adaptable
to floating reamer as
illustrated.



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THIS MONTH continued

APPOINTMENTS AND PROMOTIONS

Personnel Changes . . . Executive and Production

Carl E. Anderson has been elected president and chief executive officer of the E. W. Bliss Co., Canton, Ohio . . . The G. M. Diehl Machine Works, Inc., Wabash, Ind., appointed **Charles W. Tuttle** president . . . **Warren A. Brown** has been elected chairman of the board of directors at R. D. Wood Co., Florence, N. J. **Fred W. Stakelbeck** succeeds Brown as president and chief executive officer of the company . . . **George Friedl, Jr.** has been elected chairman of the board and chief executive officer of The Matthews Corp., Hawthorne, Calif. . . . Detroit Testing Laboratory, Inc., Detroit, Mich., has elected **Henry W. Grikscheit** executive vice-president and director. . . .



C. E. Anderson



J. J. Davis

J. J. Davis has been elected president of ESCO Corp., Portland, Ore. **Newman Ward**, former president, became chairman of the board of directors . . . McGill Mfg. Co.'s Bearing Division, Valparaiso, Ind., named **Allwyn B. Williamson** vice-president and general manager . . . **Hoyt C. Pease** has been appointed to the newly created post of vice-president of manufacturing at The Stanley Works, New Britain, Conn. . . . **Richard S. Sheetz** has been elected executive vice-president of The Ohio Crankshaft Co., Cleveland, Ohio . . . **John R. Strom** has been promoted to vice-president of the Roto-Finish Co., Kalamazoo, Mich., and the Ransohoff Co., Hamilton, Ohio . . .

Kenneth R. Strauf has been named manager of the newly established Specialty Products Division of Manitowoc Equipment Works, Manitowoc, Wis. . . . Machinery Associates, Inc., Wynnewood, Pa., has elected **C. Denson Day** president . . . Three appointments have been announced by Sunbeam Equipment Corp., Meadville, Pa. They are: **John P. Zur** as vice-president of engineering; **Williard Roth**, engineering manager; and **Norman J. Acker**, assistant engineering manager . . . **Claude W. Mason** has been named vice-president and assistant general manager of Borg-Warner Corp., Chicago, Ill. . . . **James G. Duggan** has been elected secretary and treasurer of Fansteel Metallurgical Corp., North Chicago, Illinois. . . .



K. R. Strauf

A STOCK LEMPCO DIE SET HELPED H. K. METALCRAFT DO THE "IMPOSSIBLE"!

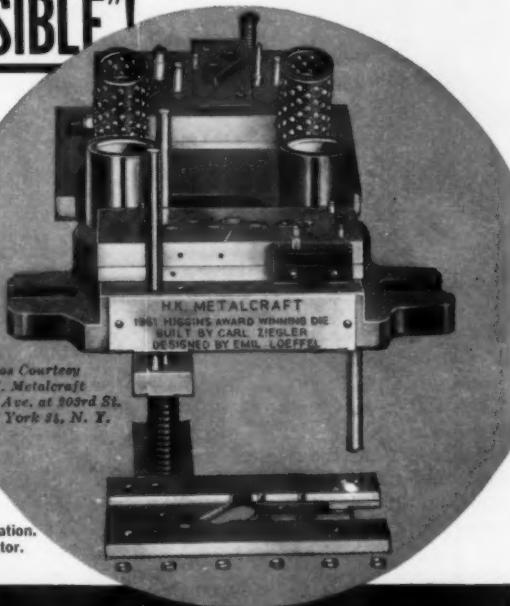
Winner of the John Woodman Higgins Award for 1961, Emil Loeffel, Metalcraft tool engineer, mounted his prize-winning dies in STOCK Lempco Die Sets, assembled to his order by a N. Y. City Lempco Distributor; see photos.

These dies produce, at \$1.75 per thousand, part which formerly cost \$12 per thousand.

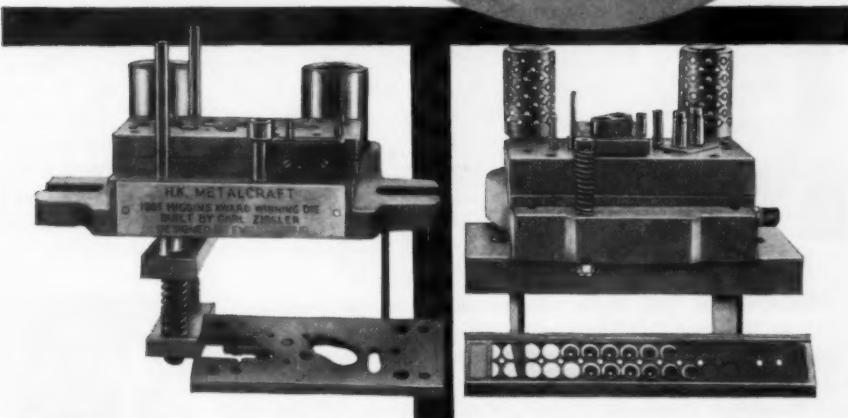
It was no accident that Lempco Die Sets were selected; Mr. Loeffel says he trusts their accuracy completely and adds, "... time saved in assembly and disassembly is very considerable".

Lempco Ball Bearing Precision Die Sets have long been known for this feature and for their ability to maintain exact alignment for millions of strokes, with an absolute minimum of maintenance. Why not find out for yourself all the advantages of using "prize-winning" die sets?

Lempco has a nation-wide warehouse organization. Write for literature and name of local distributor.



Photos Courtesy
H. K. Metalcraft
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New York 56, N. Y.



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THIS MONTH continued



Hayward F. York has been appointed manager of manufacturing engineering for Chrysler Corp., Detroit, Mich. . . . **I. C. Maust** has been named vice-president and general manager of The Bendix Corp.'s Micrometrical Mfg. Co., Ann Arbor, Mich. . . . **Stanley B. Kurzina, Jr.**, has been appointed works manager of the Borg & Beck Division of Borg-Warner Corp., Chicago, Ill. . . . Page Steel and Wire Division of American Chain & Cable Co., Monessen, Pa., has named **Ernest S. Wellhofer** plant manager . . . **Gordon C. Campbell** has been named chief industrial engineer at Alan Wood Steel Co., Conshohocken, Pa. . . .

John Powers has been named vice-president of operations at Verson Allsteel Press Co., Chicago, Ill. **Henry De Matteo** has been made manufacturing and works manager at the company . . . **Gerald G. Hoover** has been appointed manager of the Tin Plate Division of the American Can Co.'s Canco Division, Purchases, and Traffic Department, New York, N.Y. . . . **Chrysler Corp.**, Detroit, Mich., has appointed **John vonRosen** director of the corporate manufacturing staff . . . **James A. DiMizio** has been named plant manager of The Electric Autolite Co.'s Los Angeles, Calif., wire facility . . .



Edward E. Tschantz has been appointed to the newly created position of chief engineer of the Fastener Division, United Shoe Machinery Corp., Shelton, Conn. . . . **Royal Weller** has been named director of engineering for the Space Systems Division of Lockheed Missiles and Space Co., Sunnyvale, Calif. . . . **S. Tom Truby, Jr.**, has been appointed superintendent of manufacturing operations at Almo Manifold & Tool Co., Centerline, Mich. . . . **Harold C. Buell** vice-president of P. R. Mallory & Co., Inc., Indianapolis, Ind., has been placed in charge of customer relations . . .

James Kyffin was made vice-president of manufacturing at C. A. Norgren Co., Englewood, Colo. . . . Pratt & Whitney Co., Inc., West Hartford, Conn., has announced the following appointments: **Bayard Nicholas** as market research manager; and **Randolph Renda** as consultant of the Research Department . . . **Robert W. Berry, Jr.**, has been appointed chief engineer of the Wesson Corp., Ferndale, Mich. . . . The American Tool Works Co., Cincinnati, Ohio, named **Alvin C. Appel** works manager . . . **Charles W. Brunstetter** has been appointed general manager of Ipsen Industries, Inc., Rockford, Ill. . . .



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that the various makes of elevating tables are "all-pretty-much-alike", that a device so simple allows scant room for important points of superiority, then, without fail, you must have a copy of our new, FREE Portelvator Bulletin No. P/2968. Ask for it by name. Ask for it today!

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HAMILTON, OHIO

October, 1961

43

THIS MONTH continued

Personnel Changes . . . Sales and Service



F. H. Gustafson

Folke H. Gustafson has been appointed supervisor of field engineering by The Hanson-Whitney Co., Hartford, Conn. . . . **William A. Russell** was named vice-president of marketing for Miniature Precision Bearings, Inc., Keene, N. H. . . . Hanchett Magna-Lock Corp., Big Rapids, Mich., appointed **Bert G. Thorstenson** sales manager . . . **R. B. Murphy** has been appointed district manager of the Chicago sales division of the Wapakoneta Machine Co., Wapakoneta, Ohio . . . **Glenford M. Shibley** has been named sales manager of the Brush Division of The Osborn Mfg. Co., Cleveland, Ohio . . .

Thomas Z. Meggas has been named sales manager of the milling cutter and accessory product line of Futurmill, Inc., Pontiac, Mich. . . . **Charles E. Miller** has been named Houston district manager of The Carpenter Steel Co., Reading, Pa. . . . Flick-Reedy Corp., Bensenville, Ill., appointed **Richard A. Bardos** as its field engineer in the Michigan territory . . . **James A. Donnelly** has been appointed factory representative for the state of California for Alva Allen Industries, Clinton, Missouri . . .



T. Z. Meggas



Ralph Stalbaum

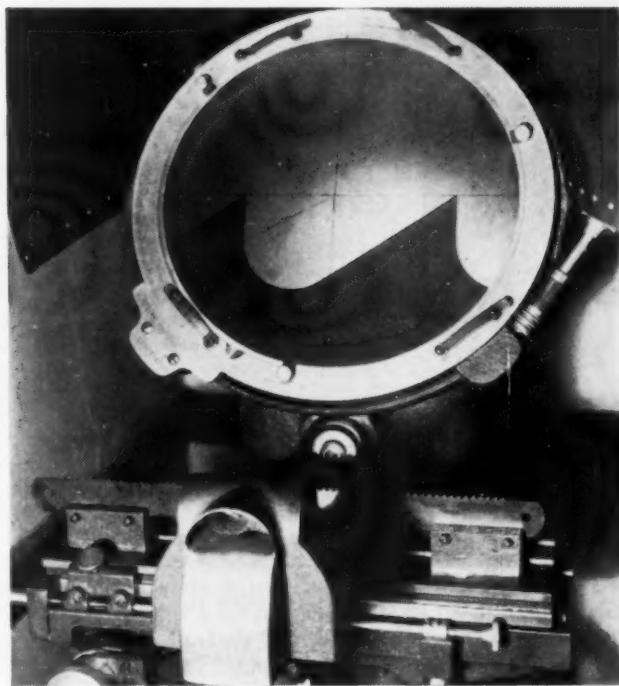
Ralph Stalbaum has been appointed district manager of the Bethlehem Corp., Bethlehem, Pa. . . . **Richard D. Taylor** has been named marketing manager for Roto-Finish Co., Kalamazoo, Mich., and the Ransohoff Co., Hamilton, Ohio . . . The Carpenter Steel Co., Reading, Pa., appointed **Robert W. Titgemeyer** and **Kenneth C. Largen** district managers of the Los Angeles and San Francisco, Calif., areas, respectively . . . Mohawk Tools, Inc., Montpelier, Ohio, named **Louis J. Limone** district sales manager . . . Hydro-Line Mfg. Co., Rockford, Ill., appointed **Frederick R. Hodgkinson** district sales manager of its Chicago, Ill., area . . .

J. B. Komendera was appointed sales manager of Mechanical Air Controls, Detroit, Mich. . . . Vickers Inc., Division of Sperry Rand Corp., Detroit, Mich., announced the appointment of **Jacques Carpenter** to the newly created position of central regional sales manager of the firm's Industrial Department . . . **Maynard D. Upper** was named industrial products manager of the middle Atlantic sales region of Sun Oil Co., Philadelphia, Pa. . . . **George F. Heath** has been appointed district sales manager by the American Sealants Co., Hartford, Conn. . . .



J. B. Komendera

CAN YOUR SAW BLADE PASS THIS TEST?



The best way to test the superiority of a Nicholson or Black Diamond blade is, of course, use. Fit one into your saw and try it. You'll know. It's the finest blade made.

But—one of the reasons for that superb performance is the Micro-Photo Quality Control Test (above). It permits constant checks on tooth formation, cant and degree of coarseness in Nicholson and Black Diamond hand hacksaw, power hacksaw and band saw blades.

Can your saw blade pass this test? It can if it wears the Nicholson or Black Diamond name.*

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Firm _____

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THIS MONTH continued



W. E. Van Horn

William E. Van Horn has been appointed Hydraulic Division sales manager of Gar Wood Industries, Inc., Wayne, Mich. . . . Air Reduction Sales Co., a Division of Air Reduction Co., Inc., New York, N.Y., named **G. L. Werly, Jr.** general marketing manager . . . **J. H. Williams & Co.**, Buffalo, N.Y., appointed the following sales representatives: **Donald R. Prather** for Oregon, Washington, and Alberta and British Columbia, Canada; **Thomas C. Anderson**, Iowa and Nebraska; **Bernard J. McCue**, northern Ohio; and **Jerome J. Moeller**, central and southern Ohio . . .

Thomas C. Brown has been named general sales manager of the Engine Parts Division of Gould-National Batteries, Inc., St. Paul, Minn. **H. C. Foster** was named to succeed Brown as replacement sales manager and **J. O. Lutz** was made manager of sales engineering, OEM and Industrial . . . **John H. Parker** has been named sales development manager for Rockwell Mfg. Co.'s Power Tool Division, Pittsburgh, Pa. . . . Chicago Pneumatic Tool Co., New York, N.Y., has appointed **Russell B. Miller** general sales manager . . . **Harold M. Parsekian** has been appointed general sales manager of Master Chemical Corp., Toledo, Ohio . . .



T. C. Brown

John E. Bashforth has been appointed field sales engineer for the lathe line of The Lodge & Shipley Co., Cincinnati, Ohio . . . Pangborn Corp., Hagerstown, Md., has announced the following appointments: **John V. Haider** as manager of the firm's Pittsburgh, Pa., sales district; and **Melvin R. Price** as sales engineer in the same district . . . The appointment of **D. E. Ligon** as field engineer in the Southwest has been announced by Denison Engineering Division, American Brake Shoe Co., Columbus, Ohio . . . **John Carter** has been named southeastern agent for Acme Chain Corp., Holyoke, Massachusetts.



J. E. Bashforth

Robert F. Dee has been named sales manager of the C. A. Norgren Co., Englewood, Colo. . . . The Carpenter Steel Co., Reading, Pa., announced the following promotions: **W. Kent Kise, Jr.**, as assistant to the manager of electronic alloy sales; and **Thomas E. Murphy** as assistant to the manager of tool steel sales . . . **Jon Henricks** has joined the export department of The DoALL Co., Des Plaines, Ill. . . . **Arthur C. Geldner** has been named assistant general sales manager of Pacific Tube Co., Los Angeles, Calif. . . .



R. F. Dee



Moore Jig Borer area at Fibreform Electronics; checking fixtures and inspection tools in the foreground.

"We feel strongly that our seven Moore Jig Borers are the heart of our business today." —says Fred H. Sperbeck, partner, Fibreform Electronics, Inc., Los Angeles

"The trend towards closer tolerances, small quantities, and quick deliveries on precision-machined parts for the electronics and missile industries has created a most difficult problem for companies manufacturing these parts.

"Our answer to this problem is the Moore Jig Borer. Through careful planning and precision gaging, we have given our jig boring area the same production capabilities as our other departments. This not only eliminates the time and cost of many precise jigs and fixtures, but also, in many cases, reduces labor costs of highly skilled operators.

"At Fibreform Electronics, we feel

strongly that the seven Moore Jig Borers we have purchased since 1956 are the heart of our business today, and will continue to be in the future."

For locating and boring holes in dies, jigs and production parts, the speed and accuracy of the Moore Jig Borer has never been equalled. You can easily split "tenths" with the new Moore No. 3 Jig Borer.

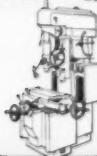
Prove it to yourself by writing for illustrated brochure. Also, on request, we will send you data on the Moore No. 3 Jig Grinder, which locates and grinds holes to less than a "tenth."

Moore Special Tool Company, Inc.
728 Union Avenue, Bridgeport 7, Connecticut



Ten pieces on one set-up means that cutting tools are loaded only 10% as often. This also cuts inspection needs to 10% of the holes. Parts are spaced on even inch increments to simplify charting.

ONLY MOORE TOOLS CAN OFFER THIS COMPLETE PACKAGE OF PRECISION



MOORE No. 3 JIG BORER
Locates and bores holes to less than a "tenth"



MOORE No. 3 JIG GRINDER
Locates and grinds holes to less than a "tenth"



MOORE UNIVERSAL MEASURING MACHINE
Measures to one-third of a "tenth"

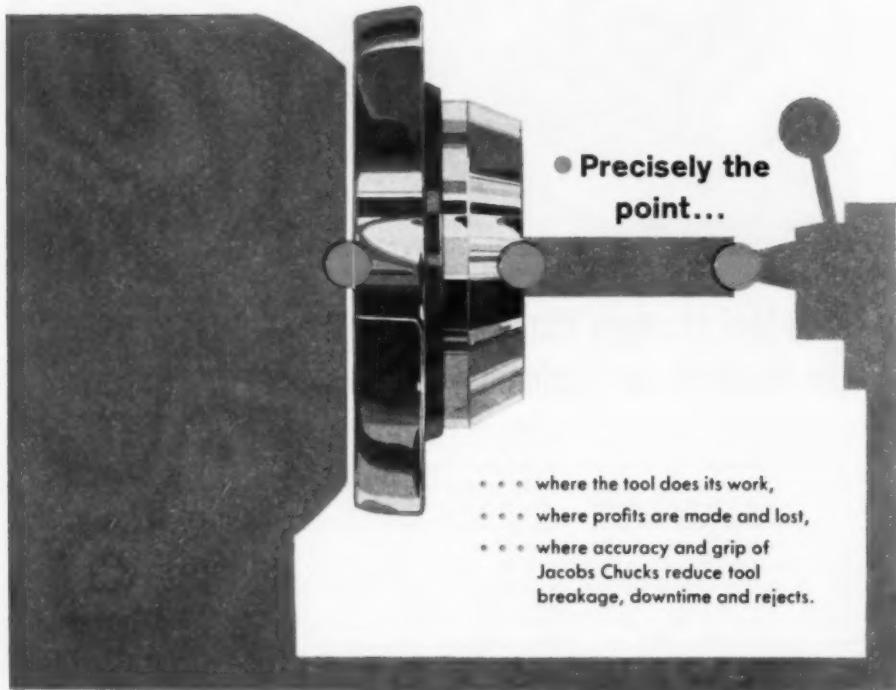


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ACCURACY GRIP



- • • where the tool does its work,
- • • where profits are made and lost,
- • • where accuracy and grip of Jacobs Chucks reduce tool breakage, downtime and rejects.

The Jacobs Model 50 is the world's most modern collet chuck. Model 50 and its entirely new series of Jacobs Rubber-Flex collets have been developed especially for Atlas, Clausing, Delta, Logan, Sheldon, South Bend and similar lathes. With Model 50 on your lathe you get a lot more for less.

ACCURACY is greater with Model 50 because collet jaws are always parallel and maximum runout is .001" T. I. R. at the nose, when properly mounted.

GRIP is greater because the extra long collet jaws have tremendous torque capacity.

modernize your old ones at the chucking end

RANGE PRICE

COMPLETE SET OF 10
RUBBER-FLEX[®] COLLETS
CHUCK ANY BAR
BETWEEN
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RANGE is greater because the 10 Rubber-Flex collets in this new series cover a greater bar stock range than 63 old-fashioned split steel collets — .100" range per collet.



PRICE is revolutionary!
\$70⁰⁰ **\$65⁰⁰**

Model 50
Collet Chuck

Complete set of 10
Rubber-Flex Collets

See your Jacobs industrial supply distributor. Give him the opportunity to prove the facts with a demonstration at your desk! Call him today. If you'd like further details before you call, write Jacobs, Dept. 196 at the address below.



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October, 1961

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Jacobs CHUCKS



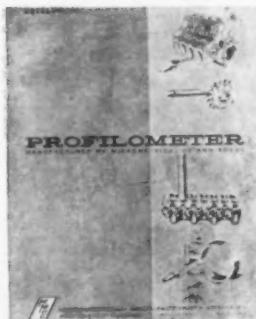
Catalogs . . . Manuals . . . Bulletins



See Number 1



See Number 2



See Number 3

. Yours without charge!
Just circle the identifying number
on one of the prepaid Action Cards

1. End Mill and Die-Sinking Cutters. Catalog 661 on the Tomkins-Johnson line of end mill and die-sinking cutters made from high-speed steel. Charts to aid the metalworking engineer in solving his cutting problems are included. The Tomkins-Johnson Co., Jackson, Mich.

2. Metal Shop Instructors ordering guide for South Bend tools and accessories with emphasis on lathes, milling machines, drill presses, bench shapers, and pedestal grinders. The company's school planning and layout service is also included. South Bend Lathe Inc., 425 E. Madison St., South Bend, Ind.

3. Profilometer. A twelve-page general catalog on the standard line of Profilometer instrumentation for the measurement and control of surface roughness. Catalog can be used as a reference guide and order book for inspectors, engineers, quality-control people, and purchasing agents. Micrometrical Mfg. Co., 4631 S. State Road, Ann Arbor, Mich.

4. Jig and Fixture Components. This conversion chart lists identical jig and fixture components manufactured by twelve different companies. It was prepared to assist purchasing agents bulk their orders rather than purchase small quantities from different companies. Northwestern Tools, Inc., 138 Hollier Ave., Dayton 3, Ohio.

5. Diamond Wheels and Hones. Catalog on diamond wheels and diamond hones with recommended starting specifications for a wide variety of applications. Included is a section on wheels for silicon and germanium cutting. Norton Co., Worcester 6, Mass.



Dust is a serious problem in most industrial plants. With Hammond DUSKOLECTORS you trap this dangerous enemy at its source before it can harm the health and efficiency of your employees and damage valuable machinery. Your cleaning and painting costs will also be reduced. Hammond DUSKOLECTORS offer you the best and most economical solution to your dust problems. Write today for catalog with helpful engineering information and interesting installation views.

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CATALOGS . . . continued

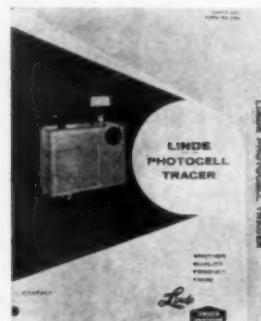
- 10. Universal Milling Machine.** A twelve-page bulletin on the construction features, operations, and optional equipment for Brown & Sharpe Dynamaster No. 2 universal milling machines that are available with either 3-, 5-, 7½-, or dual 10/5-hp. spindle drive motors and automatic climb milling arrangement. Brown & Sharpe Mfg. Co., Providence 1, R.I.
- 11. Chucks.** Catalog on conventional independent chucks; two-, three-, and six-jaw scroll chucks; and dust-proof steel-power chucks. A power chuck nomograph for calculating air-cylinder and draw-rod pull requirements to 20,000 lbs. is included. Buck Tool Co., 2015 Schippers Lane, Kalamazoo, Mich.
- 12. Closed Circuit TV.** Literature describes closed circuit TV, the new eyes for science and industry, that can be used for surveillance, transportation and dispatching, cost reduction, quality control, merchandising, security, observation of hazardous locations, and education. Also described is the Mini-Camera which can observe the interior of a 3" pipe. Electronics Division, Fairbanks, Morse & Co., 100 Electra Lane, Yonkers, N.Y.
- 13. Miniature Power Tools.** Catalog on miniature power tools and handpieces for grinding, deburring, drilling sand-
- 6. Induction Heating Machine.** Brochure on a Cincinnati high-frequency induction heating unit designed for selective heating applications on a high-production basis. It can be used for hardening, annealing, brazing, soldering, tempering, stress relieving, and shrink fitting. The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.
- 7. Spacer Bushings and Thrust Washers.** Brochure on hardened and ground spacer bushings and thrust washer with specifications and manufacturer's catalog numbers included. Detroit Ball Bearing Co., 110 W. Alexandrine, Detroit 1, Mich.
- 8. Tape-Controlled Lathe.** Bulletin 912-A-1 describes the American Tool Works' tape-controlled lathes with the company's coordinate setup system that is designed to reduce coordination time. It is based on the principle of preset interchangeable tool turrets and an adjustable limit switch stop. The American Tool Works Co., Pearl at Eggleston Ave., Cincinnati 2, Ohio.
- 9. Electronic Tracer.** Booklet on an electronic tracer which uses simple pencil line sketches to guide oxygen-controlled shape-cutting machines. Linde Co., Division of Union Carbide Corp., 270 Park Ave., New York 17, New York.



See Number 7



See Number 8



See Number 9



There's a Full Tool Steel Warehouse Behind the A-L STEELECTOR Cards!

The pocket-size STEELECTOR Cards represent a full tool steel warehouse—full of the grades and shapes and sizes.

Each STEELECTOR Card (there are cards for hot work, high speed, and tool room applications) uses bar graphs to show how the STEELECTOR grades compare in abrasion resistance, toughness, size stability, machinability, and red hardness. In a glance you can select the grade with the best combination of properties for virtually any job.

And when you select a STEELECTOR steel, you know beforehand that it is quickly available. Warehouse supplies have been increased because of the widespread usefulness of STEELECTOR grades.

A Data Stock List for each STEELECTOR grade gives you additional information—to help you make sure that the steel fits your job exactly. The steel's properties are described and the proper hardening, tempering, and annealing tem-

peratures are given along with the steel's analysis and AISI number. A list of typical applications together with suggested working hardnesses serves as an additional check on your use of the steel.

The Data Stock List also tells exactly what sizes and shapes are in warehouse stock. You know before you order that the tool steel you choose is ready for prompt delivery.

By using STEELECTOR grades, you can save storage space in your own plant. You can reduce the number of grades you stock. And you can rely on fast off-the-shelf delivery in case your own stock runs low.

For more information on the STEELECTOR system, ask your Allegheny Ludlum representative for your copy of the colorful, 10-page STEELECTOR Booklet, or write: *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pennsylvania*. Address Dept. MB-8



ALLEGHENY LUDLUM

Tool Steel warehouse stocks throughout the country

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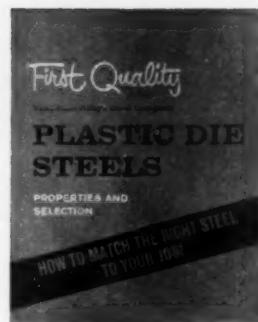
CATALOGS . . . continued



See Number 15



See Number 16



See Number 17

ing, polishing and cutting. Foredom Electric Co., Inc., Bethel, Conn.

14. Mechanical Press Brakes. A twelve-page bulletin presenting design details and specification for Verson junior and intermediate mechanical press brakes which have capacities of 50, 65, and 90 tons. Verson Allsteel Press Co., 9300 S. Kenwood Ave., Chicago 19, Ill.

15. Variable-Speed Belts. Bulletin 24103 for those who are seeking replacement variable-speed belts. All known manufacturers of such equipment are listed, as well as belt sizes. T. B. Wood's Sons Co., Chambersburg, Pa.

16. Diamond Dressing Tools. Catalog 861 on diamond dressing tools which have the diamond set in powdered metal. Fresh cutting edges of the diamond particles are continually exposed throughout the life of the tool. Koebel Diamond Tool Co., 9456 Grinnell, Detroit 13, Michigan.

17. Plastic Die Steels. Brochure describing the properties and selection of plastic die steels including a table of mold properties and heat-treating instructions compiled to facilitate die and mold steel selection. Vanadium-Alloys Steel Co., Latrobe, Pa.

18. Thread Rolls. Advantages of thread rolling are presented, along with illustrated drawing, in this eight-page bulletin. Bump-type and straddle-type as well as plunge and through-feed thread rolls, are listed. Detroit Tap and Tool Co., 8614 E. Eight Mile Road, Warren, Michigan.

19. Air-Operated Diaphragm Chucks. Brochure on diaphragm chucks for internal or external chucking with utmost accuracy and concentricity. These chucks provide repetitive accuracy as close as ".00015". Erickson Tool Co., 34340 Solon Road, Solon, Ohio.

20. Heavy-Duty Engine and Toolroom Lathes. Bulletin describes LeBlond's line of heavy-duty engine and toolroom lathes that are in the 40-hp. class. They are designed for heavy turning, as well as delicate precision work. R. K. LeBlond Machine Tool Co., Madison at Edwards Road, Cincinnati 8, Ohio.

21. Optical Measuring Instrument. Brochure on a direct-reading optical measuring instrument that can be read to ".0001" without interpolation. It indicates longitudinal, lateral, or vertical position of the table of any machining tool. Simpson Optical Mfg. Co., 3200 W. Carroll Ave., Chicago 24, Ill.

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CATALOGS . . . continued

- 22. Carbide Tools.** Catalog on carbide tools with Kennametal material. Included are carbide-tipped tools, blanks, inserts, and holders. Besly-Welles Corp., South Beloit, Ill.
- 23. Heavy-Duty, Three-Way Bed Lathes.** Bulletin on Farrel-Betts heavy-duty, three-way bed lathe which range in capacities from 32" to 92" swing. Specifications included. Farrel-Birmingham Co., Inc., Consolidated Machine Tool Division, 565 Blossom Road, Rochester 10, N.Y.
- 24. Air-Power Cylinders.** Bulletin 0200-B1 classifies the Hannifin 200 psi Series C air-power cylinder that comes with both single and double rod ends and is available in five bore sizes from 1 $\frac{1}{4}$ " to 4 $\frac{1}{2}$ ". Hannifin Co., Dept. 130, 501 S. Wolf Road, Des Plaines, Ill.
- 25. Hand-Feed Surface Grinder.** An eight-page catalog describing the Landis 6" by 18" precision hand-feed surface grinder that comes in two sizes; a 7" diameter wheel with a 1-hp., 3600 rpm spindle drive motor; and a 12" diameter wheel with a 2-hp., 1800 rpm motor. Landis Tool Co., Waynesboro, Pennsylvania.
- 26. Precision Sealed Bearing.** Complete engineering information on the "Flexeal" bearing that is a precision sealed unit which effectively blocks out dirt and retains bearing lubricant while operating at high speed in moderate to high temperatures. The Barden Corp., Danbury, Conn.
- 27. Security Services.** This Pinkerton handbook gives a detailed review of the many and varied professional security services that business and industry can outcontract to modern-day security services. Pinkerton's National Detective Agency, Inc., 100 Church St., New York 7, N.Y.
- 28. Miniature Screw Threads.** A condensation of the unified miniature screw standards. It covers screw threads smaller than 0-90 and sizes as small as .0118-318. J. I. Morris Co., 394 Elm St., Southbridge, Mass.
- 29. Brass Handbook.** Riverside-Alloy Metal Division of H. K. Porter Co., Inc., has a handbook on composition, specifications, properties, and other technical information concerning the brass wire rod and strip produced at its plant. Riverside-Alloy Metal Division, H. K. Porter Co., Inc., Riverside, New Jersey.



See Number 23



See Number 24



See Number 25

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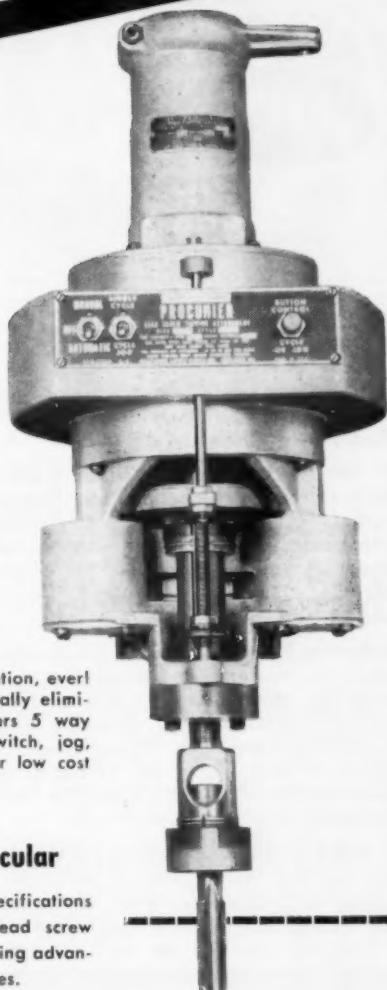
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CATALOGS . . . continued



See Number 31



See Number 32



See Number 33

30. Innershield Welding. Bulletin describes vapor-shield arc welding generated from ingredients contained in the tubular electrode. The Lincoln Electric Co., Cleveland 17, Ohio.

31. Hinged-Steel Belting. Bulletin MF-600A on hinged -steel belting that is constructed of heavy-gage steel and withstands extreme wear caused by sharp or rough materials. May-Fran Mfg. Co., 1710 Clarkstone Road, Cleveland 12, Ohio.

32. Boring Heads. Catalog D-530-A contains information on small-diameter heads for small-diameter boring, facing, turning, backfacing, grooving, and chamfering operations. Boring range is from 7/16" to 18" diameter. Giddings & Lewis Machine Tool Co., Fond Du Lac, Wisconsin.

33. O.B.I. Presses. A twelve-page bulletin on the Warco line of inclinable presses with capacities from 40 to 200 tons. They are of the single-gearred or flywheel type and can be built with double back gearing. Federal-Warco Division, The McKay Machine Co., Warren, Ohio.

34. Relief Grinding Machine. Data sheet on a floor model relief grinding machine that performs both as an ultra-precise drill point grinder and cam

relief grinder. Harig Mfg. Corp., 5757 W. Howard St., Chicago 48, Ill.

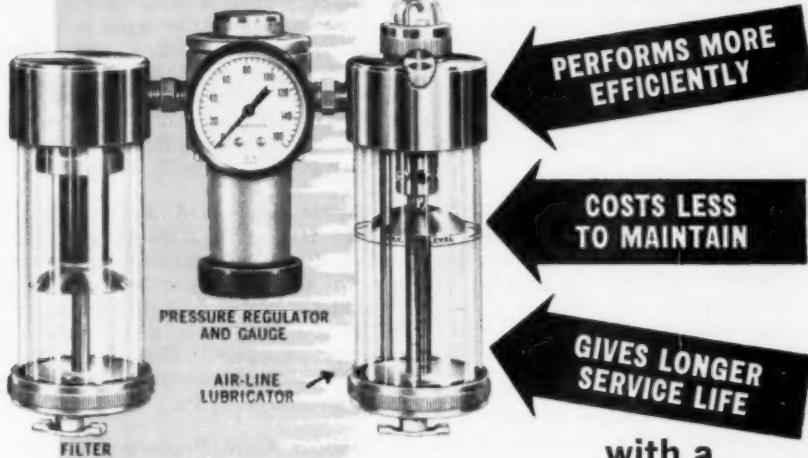
35. Digital Process Controllers. Bulletin 202-A on digital process controllers and totalizers that provide direct reading numerical indication of bi-directional counting or measuring operations and can also actuate automatic machine control functions. The Louis Allis Co., Dept. P., 427 E. Stewart St., Milwaukee 1, Wisconsin.

36. Stock and Bar Feed. Bulletin describes how the combination magazine-fed stock reel and bar feeder attachment eliminates loading downtime and provides extra long feedout. The National Acme Co., 170 E. 131 St., Cleveland 8, Ohio.

37. Cartridge Tooling. Brochure on cartridge tooling which are units with replaceable carbide-tipped and high-speed steel cartridges for internal and external machining. R. B. Tool Co., Inc., 340 Maple Ave., Westbury, N.Y.

38. Form Relieving Fixture. Catalog on performing form relief grinding on a variety of cutting tools. Setup and operation of a fixture and grinder are explained with diagrams and photographs. R-O Mfg. Co., 31171 Stephenson Highway, Madison Heights, Mich.

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CATALOGS . . . continued

39. Automatic Drilling and Tapping. Catalog on high-speed automatic drilling and tapping units with technical information, specifications, drill thrust charts, tapping-threading data, typical circuits, and applications incorporated. Hypnemat, Inc., 647 W. Virginia St., Milwaukee 4, Wis.

40. Single-End Boring Machine. Bulletin on a single-end precision boring machine designed for finish boring, facing, chamfering, grooving, gun-drilling, bore-reaming, and similar metal removing operations. This machine can also be used for semi-finishing. Olofsson Corp., Lansing, Mich.

41. Carbide Materials. Catalog and price list on Vascoloy-Ramet carbide blanks and tools, carbide and ceramic inserts, Tantung cast-alloy tools, toolholders, and face mill cutters. Vascoloy-Ramet Corp., Waukegan, Ill.

42. Universal and Radius Grinder. Brochure on a UniRad universal and radius grinder, which not only eliminates attachments, but is able to grind as many faces of a cutter as possible in a single chucking. Crosby Machine Tool Co., 4916 San Fernando Road, Glendale 4, California.



See Number 39



See Number 40



See No. 41

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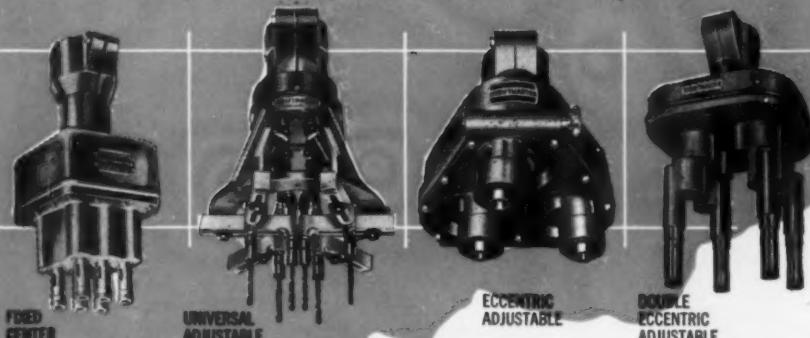
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Book Reviews



Practical Design

Of Sheet Metal Stampings

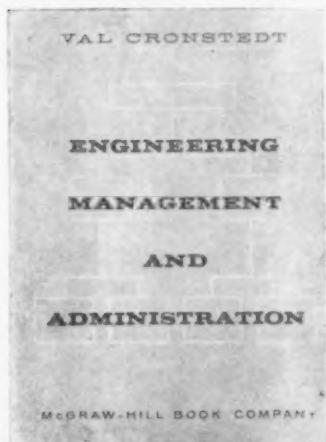
(By Federico Strasser, 555 illustrations, 175 pages, \$10.00)

Practical experience, followed by teaching, and later return to practice is the threefold combination which has made this book an important step forward in knowledge of metal stampings. Stamping techniques used in the pressworking of metals is based principally on practical knowledge, and the information which the author has gathered in this book will be valuable to anyone engaged in or interested in the production of articles made of die-produced components.

This book shows those factors in design of metal stampings which bring about economical and trouble-free production, and also how this kind of production may be achieved by intelligent application of basic rules and concepts of stamping technique. Concepts, details of design,

and special problems form the basis of this study of the processes that transform sheet metal pieces into final products.

The Book Shelf, Hitchcock Publishing Co., Wheaton, Illinois.



Engineering Management

And Administration

(By Val Cronstedt, 345 pages, \$8.50)

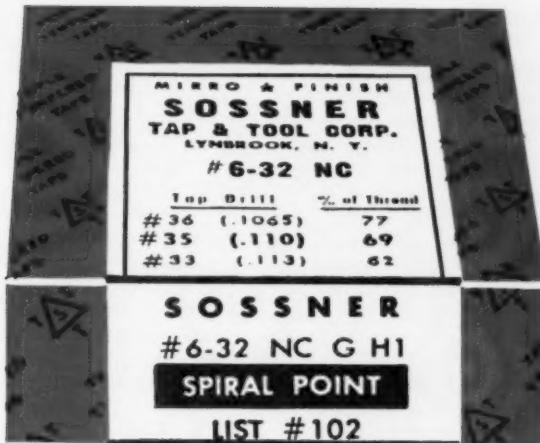
Modern tools, policies, and practices used to manage engineering departments more efficiently and effectively are defined and described in this handbook for today's engineers.

It brings together in one compact volume all those business matters—as they affect the engineering department—that the administrator must know.

Described for the engineer are the complex matters of patent law, financial controls, personnel matters, compensation administration, safeguarding of industrial secrets, and other related subjects.

The author shows the advantages of separating all administrative duties from the technical personnel. He describes the administrator's role both to the general management and to the engineering department.

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Ultrasonics and Its Industrial Applications

(By O. I. Babikov, 224 pages, \$9.75)

Here is technical data on the wide field of ultrasonics. The original text, published by the State Press for Physicomathematical Literature in Moscow in 1958, has been translated into English to benefit users of ultrasonics in this country. It begins with research on ultrasonic oscillations and sounds as they are related to certain liquids and solids. Next, the generation of ultrasound, including the magnetostriction and piezoelectric effects, is thoroughly discussed.

Flaw detection, a widely interested means of control, covers the subject matter for two chapters. First, the pulse method is presented. This includes the

flaw-detector circuit, parameters, determination of flaw sizes, acoustical contact, and applications. Using undamped oscillations is the succeeding means of detection that is discussed. Shadow and resonance is explained.

The book delves into microstructures of metals and the measurement of elastic constants, physical-chemical analysis, machining, soldering and plating, and cleaning.

Final chapter concerns itself with the metallurgical effects of the ultrasonic processing and the application of ultrasonics for improving the structure of a metal.

The Book Shelf, Hitchcock Publishing Co., Wheaton, Illinois.

Report Writing for Business

(By Raymond V. Lesikar, 337 pages, \$9.25)

This book presents the techniques, principles, and standards of successful business report writing. The entire volume is organized in the order of the report writer's work, from the initial determination of the problem to the finished report. Major emphasis

is given to the basic steps in collecting business information, and to the thinking which goes into the report. In addition, the book covers thoroughly the essential areas of report makeup and physical preparation of the report.

The text fully recognizes the fact that reports differ widely by organization and company. In overcoming this problem, it approaches the subject of report preparation from a general viewpoint. It follows the assumption that, although reports may differ, the principles of their construction (writing, organizing, and such) are universal. Thus, the general teachings of the book may be adapted easily to the specific report requirements of any organization. At the same time, however, the text contains sufficient specific instruction to enable one to construct the conventional reports.

The author has brought together the best contributions of a long line of pioneers in the field of report writing so the reader can benefit from the experience of many.

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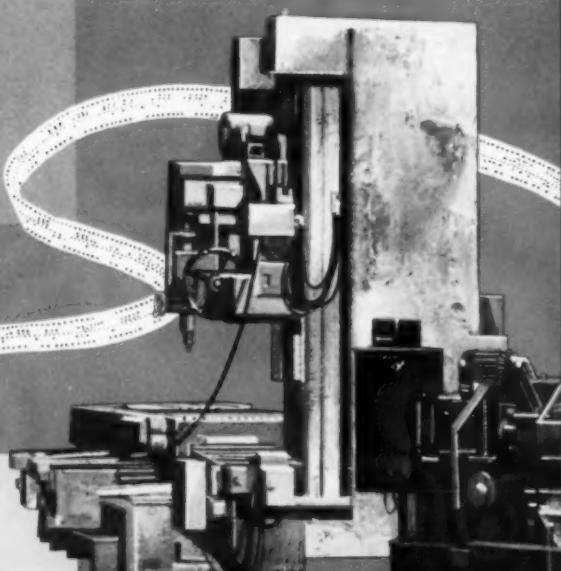
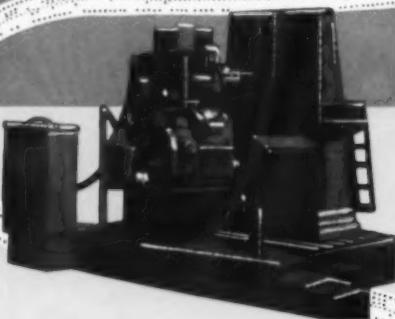
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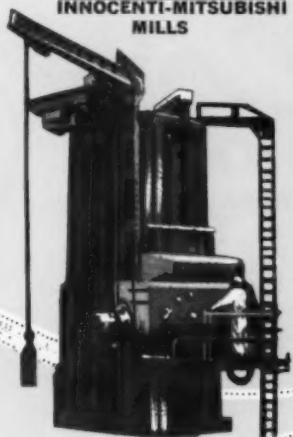
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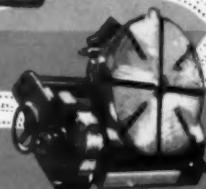
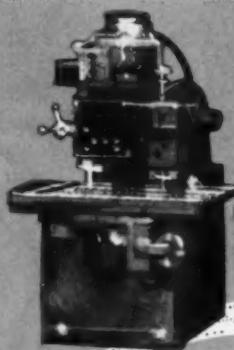
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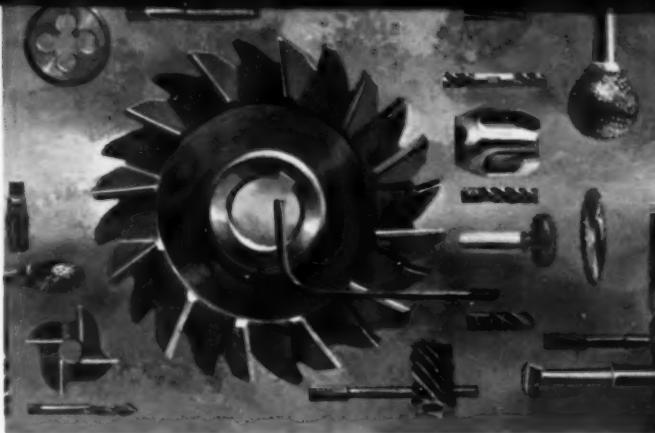
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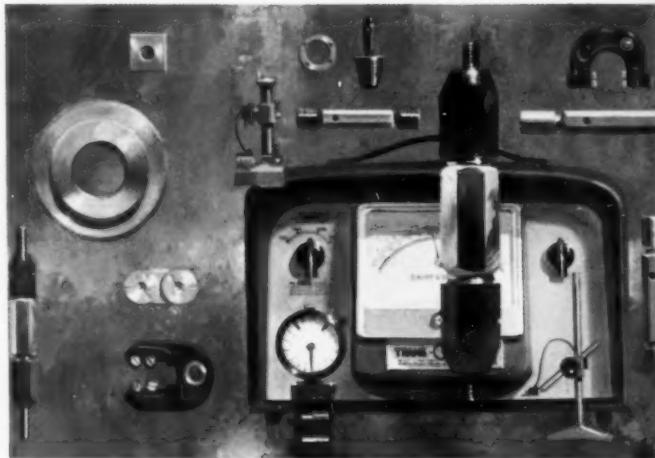
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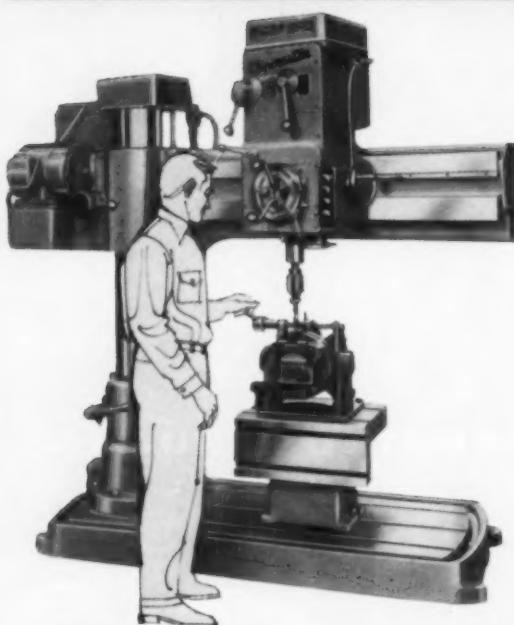
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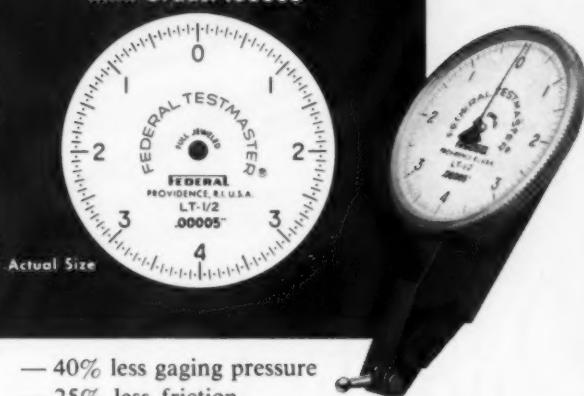
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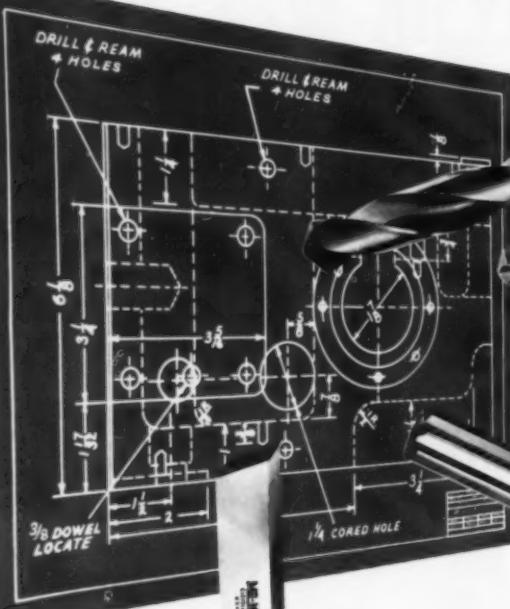
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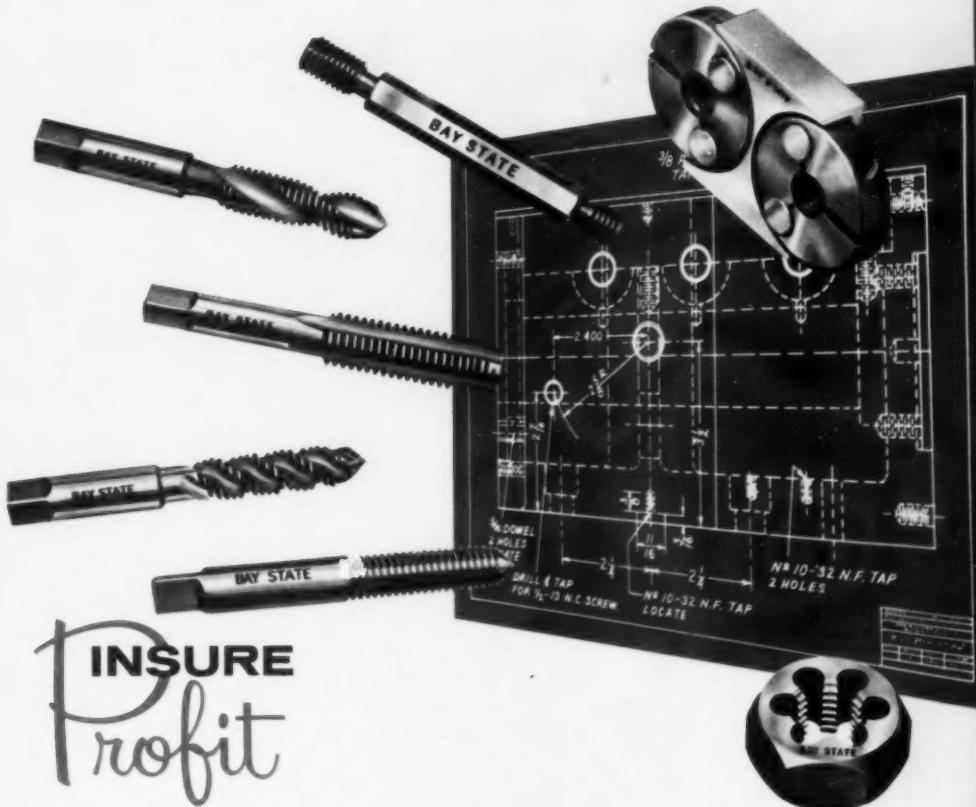


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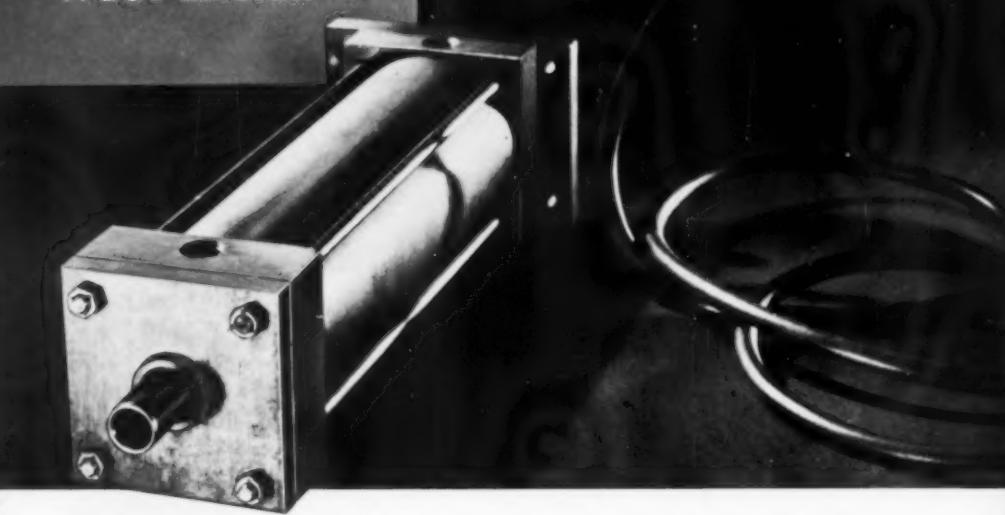


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| <input type="checkbox"/> 100-3 AIR-DRAULIC CYLS. | <input type="checkbox"/> 200-3 750 SERIES HYD. CYLS. |
| <input type="checkbox"/> 100-4 AIR VALVES | <input type="checkbox"/> 200-4 and 200-7 HYD. VALVES |
| <input type="checkbox"/> 100-5 LOGANSQUARE CYLS. | <input type="checkbox"/> 200-6 SUPER-MATIC CYLS. |
| <input type="checkbox"/> 100-6 ULTRAMOTION CYLS. | <input type="checkbox"/> ABC BOOKLET |
| <input type="checkbox"/> 100-7 SUB-PLATE AIR VALVE | <input type="checkbox"/> CIRCUIT RIDER |
| <input type="checkbox"/> 300-1 CHUCKS | <input type="checkbox"/> CALCULATOR |
| <input type="checkbox"/> 300-2 PRESSES | <input type="checkbox"/> FACTS OF LIFE |

Please send copy of catalog

NAME _____

TITLE _____

COMPANY _____

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The Only Holes You Can't Drill

Quicker... Cleaner... Cheaper

with a SPEEDICUT "CHIPBREAKER"

The SPEEDICUT "CHIPBREAKER" is not for doughnuts. But when it comes to drilling holes in metal (from $\frac{1}{4}$ " up to 6" in diameter), at the lowest cost-per-hole, there is no drill made that can do the job like a SPEEDICUT "CHIPBREAKER".

The patented rib* makes the big cost-cutting difference. Permits 50% to 400% higher feed rates... deep hole drilling without withdrawals... no down time for cleaning out packed spinnings and swarf... more holes per regrind.

But don't take our word for it. Let your local authorized SPEEDICUT "CHIPBREAKER" distributor prove it with a "no obligation" demonstration in your plant on your own equipment and type of work.

May we send you his name and a descriptive catalog of the SPEEDICUT "CHIPBREAKER"?



THE PATENTED RIB
that cannot be duplicated

SPECIFY
SPEEDICUT "CHIPBREAKER"
SPEED WITH SAFETY



*U.S. Patent Number 2769366

SPEEDICUT DIVISION • CHICAGO HEIGHTS STEEL CO. • CHICAGO HEIGHTS, ILL.

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YOU'RE ON THE MONEY
WITH UNIVERSAL
DRILL BUSHINGS



Universal drill bushings are precision made with 100% concentricity, thus assuring accurate drilling—"right on the money". In addition, knurled heads provide excellent grip; super finished bores minimize tool wear; and blended radii prevent tool hang up. All standard sizes and lengths available for immediate delivery.

Send for complete Universal catalog today.



UNIVERSAL ENGINEERING COMPANY • FRANKENMUTH 10 MICHIGAN

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219



Simonds NEW WELD-EDGE HOLE SAWS

1. Efficient. An important addition to Simonds line of quality cutting tools, Simonds new Hole Saws saw holes cleanly and efficiently in machinable materials up to 1½" thick. Ideal for portable tools, drill presses, lathes, boring mills, and milling machines . . . Simonds floating pin-drive arbor assures positive non-slip cutting.

2. Shatterproof. Made with a special wear-resistant high speed steel cutting edge, these saws stay sharp for exceptionally long periods. Rugged. Tough. Simonds cutting edge is permanently bonded to a tough alloy steel body for maximum strength and resiliency . . . makes these the sturdiest hole saws you can buy.

NOW
***cut more holes
per dollar***

3. Easy-Out. Simonds knock-out slots allow easy removal of cores. "Follow through" design of cap permits sawing deep holes in stacked or layers of material where cores can be removed. Now available from your nearby Simonds Distributor for hole sizes from $\frac{1}{8}$ " to 6" diameter. 6 mandrel sizes offered for light to heavy cutting. Call and try some today. Discover how "Simonds means savings whatever you cut."



SIMONDS
SAW AND STEEL CO.

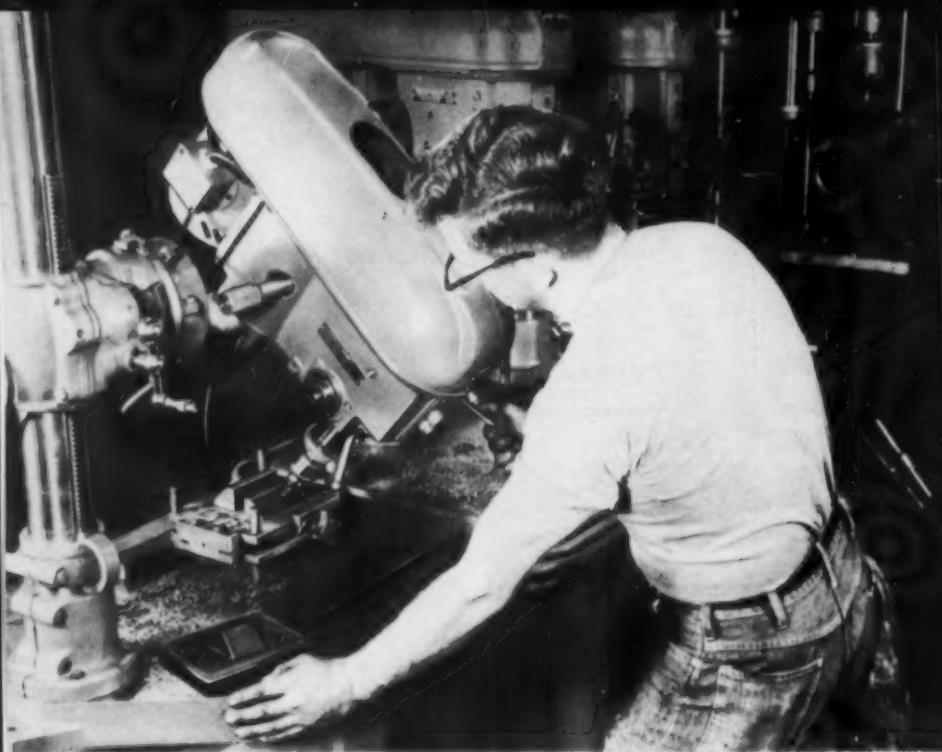
FITCHBURG, MASSACHUSETTS

Buy through your local Simonds Distributor for

— Local Stocks — Local Speed — Local Skill

Factory Branches in Union, N. J., Chicago, Shreveport, La., Los Angeles, San Francisco, Portland, Ore. • Canadian Factory in Granby, Que. • Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.; Heller Tool Co., Newcomerstown, Ohio; Simonds Abrasive Co., Philadelphia, Pa. and Arvida, Que., Can.

Use postpaid card. Circle No. 242



Position the tool—not the work with this new Delta Unidrill®*



New Delta Unidrill line is available in bench and floor models or as components for custom assembly. Choose Utility or Deluxe Head, High or Slo Speed, Key Chuck or Tapered Spindle.

FREE BROCHURE catalogs full Radial Drill Press line. Write: Rockwell Manufacturing Company, Delta Power Tool Division, 610K N. Lexington Ave., Pittsburgh 8 Pa.

Use postpaid card. Circle No. 243

It's the unique double-swivel design that gives this new 2-foot arm radial drill press such big job capacity—in metal or wood. You can do more jobs faster and easier because you can move and tilt the drill head—position the cutting tool to the work in five different ways! This saves the cost of expensive jigs and cuts time-consuming shifting of the work.

You can drill to the center of a 48" circle—on or off the table. And with six interchangeable spindles or spindle adapters, you can change in seconds to handle reaming or spot facing of metal, routing or planing of wood, and many other jobs.

The only way to see how the Unidrill can solve your drilling problem is to see this flexibility in action. Your Delta Industrial Distributor (under TOOLS or MACHINES in the Yellow Pages) will gladly demonstrate. Call him.

*Trademark

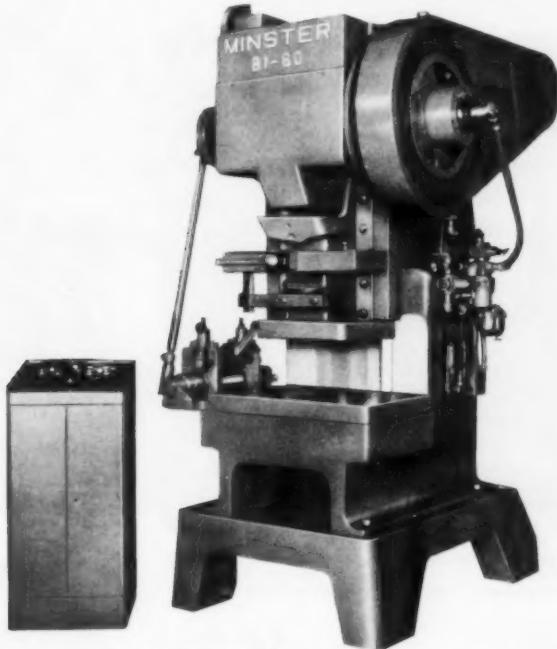
DELTA INDUSTRIAL TOOLS

another fine product by

ROCKWELL



*If you make small parts in large volume....
this B1 press will make them faster,
more accurately and at lower cost per part.*



CONSIDER IT!

Improvements in tooling and production technology have led to higher speeds, more intricate dies and multi-stage operations. Minster anticipated the industry's need for a press specifically designed for high speed, small parts stamping. We were best prepared to develop such a press. Minster B1 presses have greater stability, precision and rigidity to do the job. Capacity range is 16 to 60 tons . . . proper feed equipment available to match your job. Ask a Minster representative to show you why a B1 press is superior.

The Minster Machine Company, Minster Ohio

MINSTER®

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IT'S A FACT!

You can tap 1/2" holes

with a light drill press and Supreme's

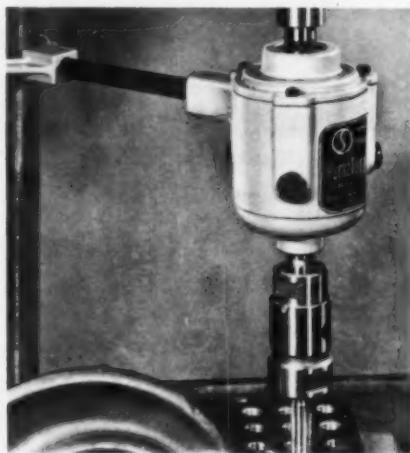
New **VersaTAPPER**



Shaft of Model 6100 is held in drill press chuck. No. 6200 (above) has Tapered spindle.



Supreme Accutap Chuck is standard equipment with VersaTAPPER. Capacity 0-1/2"



VersaTAPPER is a compact precision-made tapping unit. Fits any drill press... features half-inch capacity range plus 4-time increase in torque. Easy to install. Simple and quick to remove after use.

VersaTAPPER...
operates easily in any material
...with widest capacity range
... yet costs far less

\$63⁰⁰
JUST
COMPLETE

The new VersaTAPPER has scored an instant success with production people everywhere. It has more versatility than other tapping devices. It has the *widest capacity range*—from 0 to 1/2", but depending on application, use of taps smaller than No. 10 is limited. It develops *more power*—makes the tapping of 1/2"-13 holes a simpler matter, even with

light duty drill presses. VersaTAPPER is *simple to use*—can be successfully operated by anyone in your shop.

All of these features at the remarkably low price of \$63.00 complete marks VersaTAPPER as a product you must see at the first opportunity. It's available at your local Supreme Chuck distributor. Call him soon.

Supreme

PRODUCTS CORPORATION

2222 S. CALUMET AVENUE

CHICAGO 16, ILLINOIS



PRECISION  PRODUCTS

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You get more from power tools with Top Quality Supreme Accessories



Supreme Brand Chucks

Noted for unmatched quality—The widest range of sizes and types... one for every machine in your shop. Exclusive Supreme hardening means greater accuracy—longer wear.



Supreme Versamatic

Reversible speed reducer for portable drills. Fits all makes—permits their use for power screw driving, nut running and heavy duty drilling. 7 to 1 reduction means high torque increase. A fine tool.



Supreme Push-Pull Tapper

Like the Versamatic, but made for the single purpose of tapping with portable drills. Reverses instantly for tap removal. Handles taps up to 5/16" diameter. Top quality. Simple to operate.

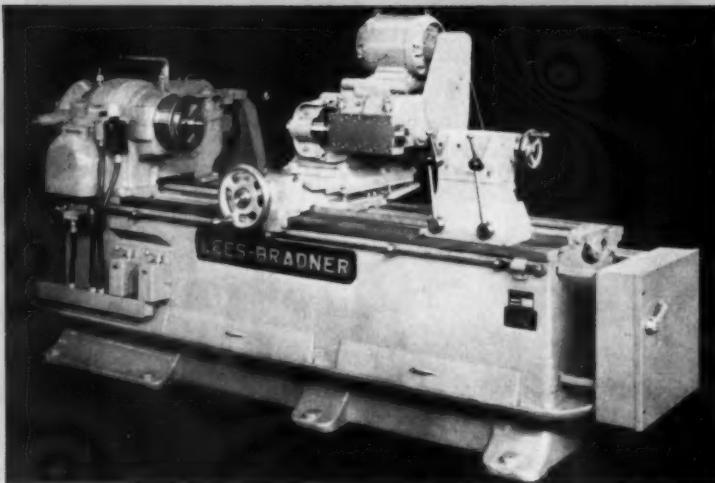
**SUPREME PRODUCTS
ARE IN STOCK IN
YOUR CITY.
CALL YOUR
DISTRIBUTOR**

This WORM...



will turn better...thanks to...

THE LEES-BRADNER HT



Building precision into other machine tools is the unique distinction that can be claimed for The Lees-Bradner Model HT Thread Milling Machine.

The worm illustrated above was produced on this machine by the Cleveland Worm and Gear Co. in one hour 23 minutes at a cutter spindle speed of 61 R. P. M. The pitch diameter of the worm was 3.728" with an outside diameter of 4.625".

Many tough thread milling problems like this have been, and are being, solved by this remarkably versatile machine.

Contact us or your local Lees-Bradner representative for complete information on fast, precision threading with the Model HT Universal Thread Milling Machine.

Details on Worm Gear Production

Hob Spindle Speed	61 R. P. M.
Circular Pitch	1.420"
Pitch Diameter	3.728"
Outside Diameter	4.625"
Threading Time	1 hour 23 min.
Material	2315 Steel
Weight of Worm	51.76 lbs.

IMPROVING GEARS... FOR 50 YEARS!

the
LEES-BRADNER
Company
CLEVELAND 11, OHIO, U.S.A.

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STRIPPIT FLEX-O-DRILL CUTS TIME IN HALF

8

7

6

5

4

STRIPPIT Flex-O-Drill Drilling-Layout machine offers you low cost, quality equipment that drills, reams, center punches and scribes within $\pm .002"$ accuracy. Designed for template layout and drilling, it's also ideally suited for pilot runs and short run production. A new, inexpensive accessory utilizing a high quality optical instrument converts the Flex-O-Drill to an accurate machine for checking drawings, patterns, templates or production pieces.

STRIPPIT Flex-O-Drill permits you to work directly from a chart of x and y coordinates...no need to make base line drawings. Adjustable steel tapes quickly set up coarse dimensions. Quick-set Micrometric Gages provide fast, accurate adjustment to thousandths. Result...template making time slashed as much as 50% or more.

STRIPPIT Flex-O-Drill can be operated by anyone with only a few minutes of study. Let our STRIPPIT Tool & Methods Engineer explain the finer points of the Flex-O-Drill and demonstrate it in your plant. Or write for catalog FD.

WALES **STRIPPIT** INC.

204 Buell Road • Akron, New York

In Canada: Strippit Tool & Machine Company, Brampton, Ontario

In Continental Europe: Rastin, S.A., Lausanne, Switzerland

In the British Isles: Kearney & Trecker-C.V.A. Ltd., Hove, Sussex, England

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FIVE-WAY IMPROVEMENT

in grinding operations with the
new cutting fluid, FIVE-STAR
CIMCOOL, on the job in
Pennsylvania.

(Company name on request)

FIELD SERVICE REPORT

in the manufacture of air compressors. They had tried several cutting fluids but kept having problems with rust, rancidity and skin irritation.

Then we installed Five-Star Cimcool at 50-1 for a 3 month test, grinding iron, stainless steel, tool steel and aluminum. The results were excellent.

They have no rancidity, even after 3 months operation. They proved by laboratory testing that skin irritation had been eliminated. There was no rusting of iron or steel, no corrosion of bronze or aluminum parts. They not only saved money by not having to change the cutting fluid, but they doubled the pieces per dress. They are very enthusiastic about Five-Star Cimcool.

Herb Whittaker
Pittsburgh Office

CIMCOOL
Cutting Fluids

FOR 100% OF ALL METAL CUTTING JOBS

Production-Proved products of The Cincinnati Milling Machine Co.

FIVE-STAR CIMCOOL—New, versatile "one-mix" cutting fluid, long-lasting, trouble-free.

CIMPERIAL—Heavy duty replacement for cutting oils in those low-speed tough jobs.

CIMPUS—The transparent grinding fluid which provides exceptional run control.

CIMCUT Concentrates (AA, NC, SS)—For every job requiring an oil-base cutting fluid.

ALSO—CIMCOOL Tapping Compound—CIMCOOL Bactericide—CIMCOOL Machine Cleaner.

For full information on the complete family of Cimcool Cutting Fluids, call your Cimcool Distributor. Or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

*Trade Marks Reg. U. S. Pat. Off.

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October, 1961

83

NOW...A Larger Capacity FELLOWS-PFAUTER High-Speed Hobbing Machine...The P 630

You get all the advanced-design features of the production-proved P 400

Felows-Pfauter hobbing machine — plus extra work capacity

— with the new Model P 630. Takes work up to a diameter of 25".

Maximum face width at 25" diameter is $16\frac{1}{4}$ ". Maximum diametral pitch in steel is 3. It's fast, easy-to-handle . . . and it's built for high production.

For example: Work area is readily accessible for setup and loading. Table retracts automatically from hob to facilitate work changes. Hob shifting is controlled by pushbutton. And built-in hydraulics assure smooth operation of tailstock and fixtures.

Solid construction features include: rugged hob head and double wall construction column and bed, with heavy V-ways. Table is as large as maximum workpiece diameter, and index worm gear nearly as large as work table. Work column is of massive design.

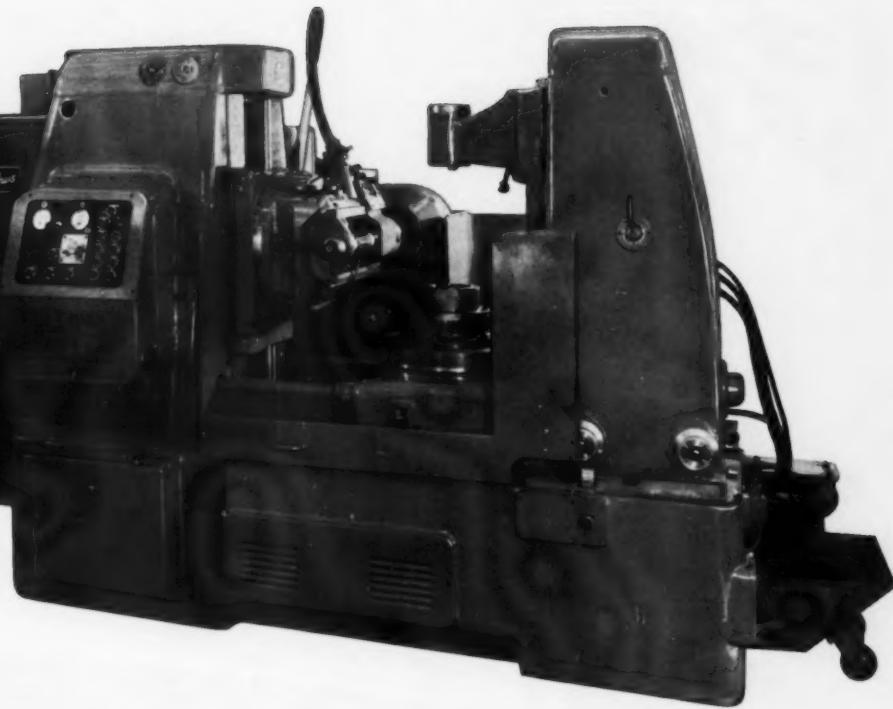
Reduce your production costs with this new Fellows-Pfauter.

Get complete details now.



NEW . . . Dictionary of Change-Gear Combinations

Eliminate tedious calculations and trial-and-error methods for finding change gear combinations. Now, simply look them up like words in a dictionary in "Fellows-Pfauter Change Gear Tables" by F. Becher and A. Koerner. This English edition contains combinations for more than 26,000 ratios carried to six decimal places from .100,000 to 1,000,000, with the greatest step approximately .00005. Change gears in the range of 18 to 80 teeth are mainly used. Examples of applications are given. Only \$8.00. Get a copy now. Send your order to THE FELLOWS GEAR SHAPER COMPANY, 78 River Street, Springfield, Vermont, U. S. A.



THE
PRECISION
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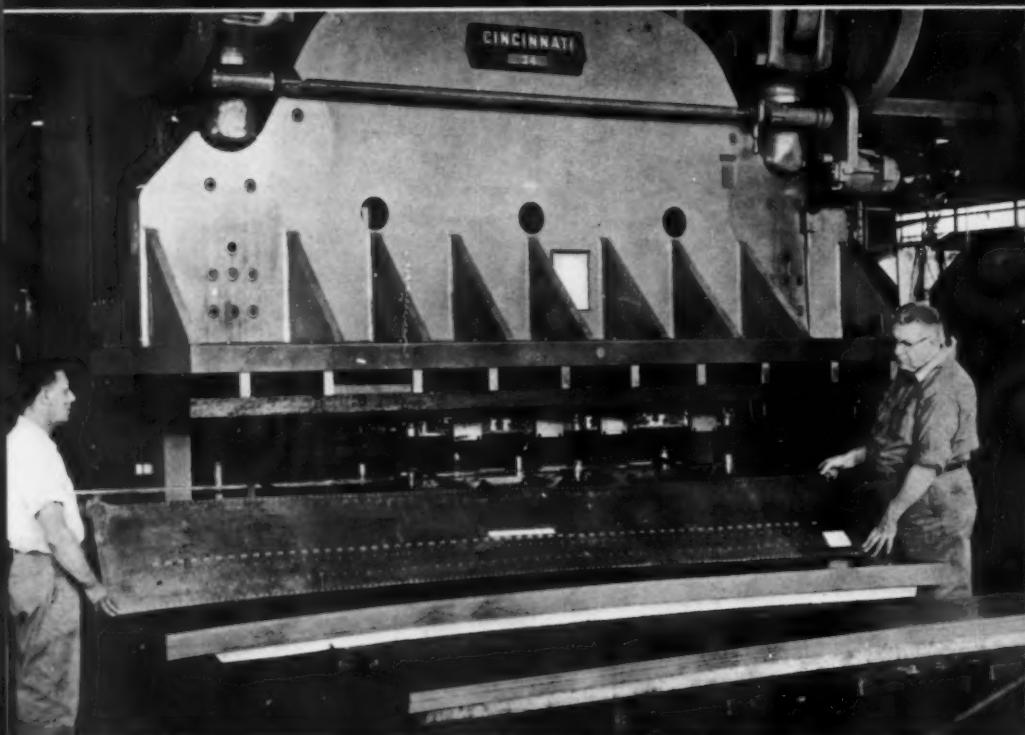
Gear Production Equipment

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October, 1961

85

CINCINNATI® PRESS BRAKE cuts press work costs



Courtesy Dahlstrom Manufacturing Corporation, Jamestown, N. Y.

For half the initial cost of a conventional press with equal die area and tonnage, the Dahlstrom Manufacturing Corporation does its press work on a Cincinnati Press Brake with widened bed and ram.

Its low first cost has been followed by other savings, too. For example, setup and operation are easy and fast because the die area is out in front of the housings. Floor-to-floor time per piece is half what it was with previous production methods. Cincinnati accuracy holds .005" tolerances between holes.

Dahlstrom uses the full versatility of the Cincinnati Press Brake for shallow draw work, blanking, notching, and punching. Ask our representative to show you how to earn similar savings in your shop.

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Shapers / Shears / Press Brakes

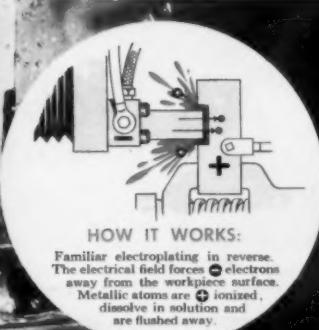
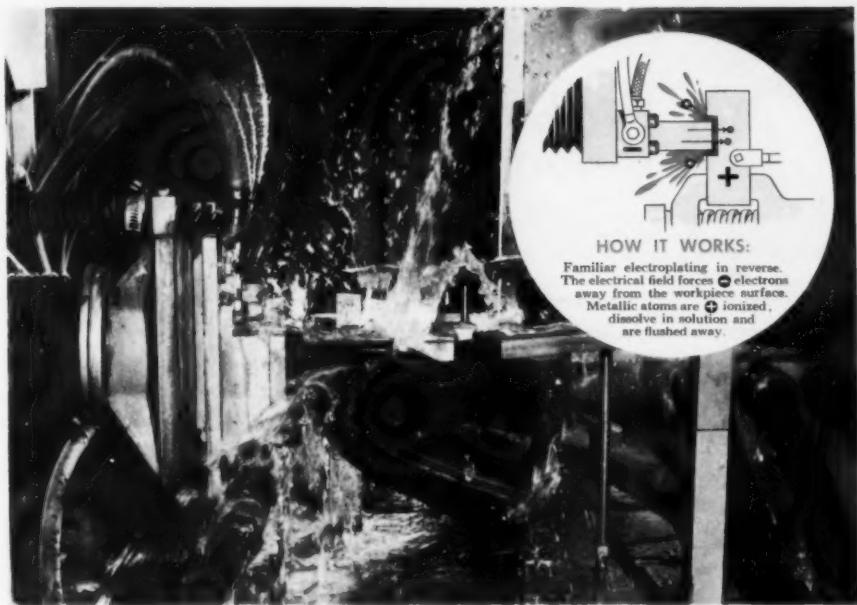
THE **CINCINNATI**



SHAPER CO.

Cincinnati 11, Ohio, U.S.A.

United Kingdom: The Cincinnati Shaper Co., Ltd., Glasgow, Scotland



HOW IT WORKS:

Familiar electroplating in reverse. The electrical field forces electrons away from the workpiece surface. Metallic atoms are + ionized, dissolve in solution and are flushed away.

This is ANOCUTTING®

Modern Electrolytic Machining . . . Key to Lower Production Costs

The only sound, a rush of fluid. The tool never touches the workpiece. There is no friction, no tool wear, no heat, no sparks. Metal is dissolved electrochemically, with precise control of size and finish.

ANOCUTTING can overcome many of your most troublesome machining problems. It moves at top speed through delicate cuts or through the hardest alloys. No heat damage ever. Burrs never form. 'Sink' a square hole . . . or any other shape for that matter. The tougher the job, the more you can save with ANOCUT.

Use ANOCUTTING to profile, turn, grind, plane, slot. A variety of versatile ANOCUT machine tools are available.

WRITE FOR FACT PACK. Tells what ANOCUTTING does, how and when to use it, how much it saves. Write Today!

Anocut®
ENGINEERING COMPANY
631 West Washington Boulevard • Chicago 6, Illinois



**ANOCUTTING
CAN SOLVE
YOUR TOUGHEST
MACHINING
PROBLEMS**

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October, 1961

87

Sweet Music for Tomorrow



Just as manufacturers the world over choose famous V-M Record Changers for their dependability and full fidelity of performance, V-M chooses South Bend 13" Toolroom Lathes.

They demand exacting model work and they get it on these precision lathes—every time. If your experimental or production work require exceptional tolerances and fine finishes, you'll be interested in what you can accomplish on South Bends. Write now for complete information.

Prices of 13" Toolroom Lathes start at \$2358, a time payment plan is available.



Machining a turntable in the Model Shop of V-M Corporation, Benton Harbor, Michigan.



SOUTH BEND LATHE

SOUTH BEND LATHE, Inc.
South Bend 22, Indiana



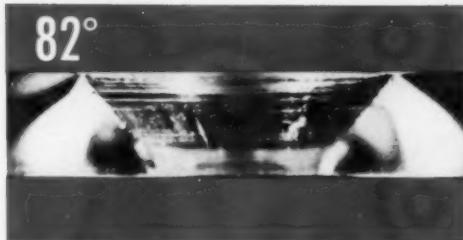
Builders of Lathes • Milling Machines • Shapers • Drill Presses • Pedestal Grinders

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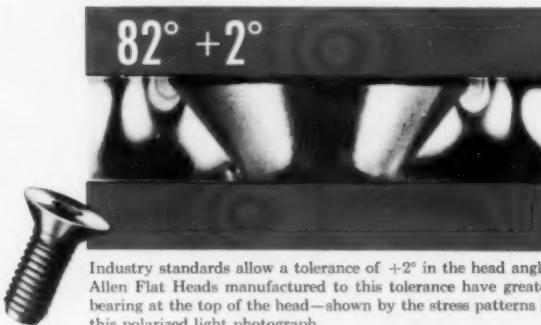
PQA*

proves it...

**this Allen
Flat Head
Cap Screw has
complete
all-around
head contact**



PQA makes it certain that an Allen Flat Head Cap Screw has contact throughout the angle of the head with the mating countersunk hole. This assures the strongest possible fastening. In this photo, made with polarized light, you can see the stress points throughout the chamfer.



Industry standards allow a tolerance of $+2^\circ$ in the head angle. Allen Flat Heads manufactured to this tolerance have greater bearing at the top of the head—shown by the stress patterns in this polarized light photograph.

*PRODUCT QUALITY ASSURANCE

ALLEN

MANUFACTURING COMPANY
HARTFORD 1, CONNECTICUT, U.S.A.

Plant at Bloomfield, Connecticut
Warehouses in Chicago, Cleveland and Los Angeles

Genuine ALLEN products are available only through your ALLEN Distributor. He maintains complete stocks close by to help cut your freight costs, inventory, warehousing and handling. He offers fast, single-source service. He knows ALLEN products. And he makes ALLEN Engineering Service available to you any time. Call him!



Industry also allows a tolerance of -2° in the head angle. *But Allen does not utilize this negative tolerance.* The reason—it is entirely possible to have head seating efficiency reduced because of excessive interference in the head-shank area. The photo shows high bearing stress in this area—with risk of breaking prematurely.

PRODUCT QUALITY ASSURANCE is the symbol of unquestioned quality of ALLEN. It stands for constant quality control every step of the way—your guarantee of quality and reliability.

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THIS... IS WHAT YOU BUY!

POWER — clean, dry, drip-free power at the business end of a Hannifin piston rod is the result of Hannifin extra quality, and at no extra cost. Bores are honed to 15 RMS or finer . . . piston rods are case hardened, plated and polished to 10 RMS or better. Cartridge gland, removable without dismantling cylinder, has exclusive Hannifin-developed "Lipseal®-Wiperseal®" combination for a truly drip-free rod.

Modern straight thread leak-proof ports for easily positioned fittings are available at no extra cost on hydraulic cylinders.

HYDRAULIC CYLINDERS



Two Pressure Ratings

2000 psi (3000 psi non shock), the famous heavy duty Hannifin Series "W" in 1½" to 12" bores.

1000 psi, Series "L", 1" to 8" bore, Hannifin quality in a lighter cylinder. Full compliance JIC Hydraulic Specs.

AIR CYLINDERS



1½" to 14" Bores

Series "A"—stainless heads, honed brass body for corrosion resistance, precision ground and hard chrome plated piston rod. For all heavy duty air service. Easily modified for water service. Full compliance JIC Pneumatic Specs.

AIR MOTORS



1½" to 4½" Bores

New from Hannifin, a complete power package combining cylinder and solenoid valve. Only one air line connection. Four mounting styles. Interchangeable mounting dimensions for most applications.



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HANNIFIN COMPANY DIVISION

529 South Wolf Road • Des Plaines, Illinois

PNEUMATIC AND HYDRAULIC SYSTEM COMPONENTS

EUROPEAN DIVISION - PARKER-HANNIFIN N.V. - SCHIPHOL - THE NETHERLANDS

3120-RMs

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90

MACHINE and TOOL BLUE BOOK

*Operator loads
stainless steel "irons"
of any shape at random*

DATA

5 units with 5 spindles
24-inch index table
6 work fixtures
80-inch base
165 parts per hour gross

KINGSBURY

Kingsbury machine performs all the operations on the HOLE IN ONE chucking

We used a similar headline in a 1931 ad and couldn't resist using it again. In thirty years our machines have changed a lot. But the basic principle is still the same: Combine operations in one chucking for lower unit costs and closer tolerances.

You could probably build your own machine for a simple job like this. It might cost you less. But you might also sacrifice accuracy and reliability.

On this job both the concentricity and diameter of the tapered hole are critical. If the hole were not concentric with the O.D. of the stem, the head would not align with the shaft of the club. So the spindles and work fixtures are in perfect relationship.

The hole diameter is also critical because its taper is so shallow. If the diameter were only .003 oversize, the shaft would go $\frac{1}{2}$ -inch too far into the hole and the club would be too short. So we hold the depth of taper exactly.

Even on much tougher jobs, Kingsbury machines turn out good parts hour after hour, month after month. That's because of good basic design and accurate, rugged construction. We run off test samples for your approval before shipment.

To save money in drilling type operations, ask us for a proposal. Kingsbury Machine Tool Corporation, Keene, New Hampshire.

**FORGED STAINLESS STEEL
GOLF CLUB HEADS**

(two styles shown)



**Vertical Unit
with Milling Head**

1 - MILL OFF THE STEM END

Four Horizontal Units

2 - DRILL HALF DEPTH

3 - DRILL FULL DEPTH
AND CHAMFER

4 - ROUGH TAPER REAM

5 - FINISH TAPER REAM

6 - LOAD AND UNLOAD



TAKE THE GAMBLE OUT OF BUYING! Get the double assurance of Heller Die Steel and your Heller Distributor's dependable service the next time you order. They are "sure bets" for complete satisfaction.



HELLER TOOL CO.

Branches and Warehouses: Union, N. J. • Detroit • Chicago • Shreveport • Los Angeles • San Francisco • Portland, Oregon

SLASHES PREPARATION TIME ... CUTS TOOL MAKING COSTS

PRECISION GROUND FOR IMMEDIATE MACHINING. Heller die steel is spheroidize annealed for quick machining and uniform hardening... right and ready for immediate use. Precision ground to a smooth surface finish of less than .35 micro-inches... free from defects and decarburization.

COMPLETE RANGE OF SIZES — INDIVIDUALLY WRAPPED. Heller's Oil Hardening and Air Hardening types are available in over 1300 stock sizes in 18" and 36" lengths. Each unit is individually wrapped for maximum protection... labeled with easy-to-follow heat treating instructions.

CHOICE OF OIL HARDENING OR AIR HARDENING TYPES. Heller has a flat ground die steel for every requirement. Oil Hardening, type 01 wear-resistant alloy steel for general purposes... Air Hardening 5% Chrome type that provides an even higher degree of wearability. Both are recommended for dies, punches, jigs, machine parts and similar applications. Where top-flight performance is a must — Heller's Air Hardening is the answer. It reacts more favorably to heat treatment... assures greater margins of safety.

LOW CARBON STEEL IS AVAILABLE TOO. Where heat treating is not a necessity — Heller's fine-grained, silicon-killed, Low Carbon Steel is ideal. Extremely versatile, it is easy to machine and weld.

17-6-6



America's Oldest File Manufacturer
NEWCOMERSTOWN, OHIO
Subsidiary of Simonds Saw and Steel Co.

Use postpaid card. Circle No. 256

For the men of action in metalworking

The use of better machines, tools and production methods has made America the greatest industrial power in the world today and has brought our peoples the highest living standards in the history of man. However, today our efficient productive capacity is being eroded by the accelerating factor of obsolescence. If we are to win this economic war and maintain our economic leadership, we must completely modernize all of our machines and tools and our total production methods or we could lose this economic war.

The MACHINE and TOOL BLUE BOOK, serving the metalworking industry since 1906, today has—
• new publishing concepts
• new editorial ideas
• new saves
• new dynamic editorial illustrations and photographs
• new editorial engravings and offset printing
• new high quality paper and printing ink—

—to serve our readers with an editorial compression—of total industry developments of vital importance—that gives it the most important editorial impact in the metalworking industry.

New circulation coverage and penetration with a circulation of 60,260 gives the MACHINE and TOOL BLUE BOOK the largest circulation of the major publications serving the metalworking industry.

Since 1951 HITCHCOCK'S MACHINE and TOOL DIRECTORY has been the most comprehensive Directory serving the entire metalworking market and is the industry's primary guide in the purchasing of metalworking equipment and supplies.

A circulation of over 30,000 copies brings this handy desk-size Directory to the key buying influences in the metalworking industry where it's used and re-used at the time of selection and purchase for a full year.



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MACHINE AND TOOL BLUE BOOK
HITCHCOCK'S MACHINE AND TOOL DIRECTORY

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HITCHCOCK BUILDINGS

WHEATON, ILLINOIS

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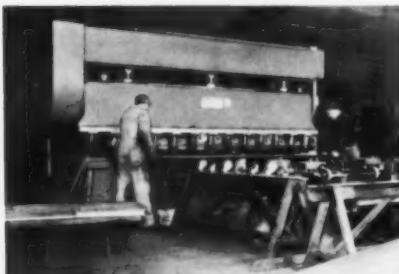
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This shear cuts pipe line plate accurately. It has been doing so for years with only minimum maintenance.



Three completed pipes ready for shipment. Size: 35'-0" x 54" dia. x $\frac{1}{8}$ " wall. Weight each: 9,315 lbs. Part of an order for 24,500 feet.

Other typical pipe orders: (a) 600 feet of 72" dia. x $\frac{1}{8}$ " wall; (b) 15,500 ft. x 48" dia. x $\frac{1}{8}$ " wall. All plates used for these pipes cut on four sides by Steelweld Shear illustrated.

Dominion Bridge Company, Ltd., is the largest steel fabricating concern in Canada. Among its many activities is that of making steel pipe for Canadian pipe lines. At its Pacific Division, Vancouver, B. C., pipe is made in various diameters, mostly 3'-0" to 5'-0", and usually in lengths of 35'-0" to 40'-0". Pipe walls generally range from $\frac{1}{4}$ " to $\frac{1}{2}$ ".

One typical order called for 35 miles of 36" pipe in 40'-0" lengths with $\frac{1}{4}$ " and 5/16" walls. This required 10,000 tons of steel. Five to seven plates were used for each pipe. Each plate was cut on all four sides to assure accuracy and squareness required for perfect fitting. Over a million feet of steel was sheared for this job — all on one Steelweld Shear.

The machine worked 15 hours a day, cutting 12,000 to 14,000 feet. The knives needed turning to a sharp

CUTS MILLIONS OF FEET OF STEEL SQUARE and ACCURATE

Steelweld Shear Speeds
Big Pipe Line Shearing



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Heavy construction of the shear, Steelweld's own air-operated clutch, easy knife adjustment to suit metal thickness, and electric foot switch control, are some of the factors contributing to the success of Steelweld's on hard service jobs.

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PIVOTED Mechanical and Hydraulic
BLADE SHEARS



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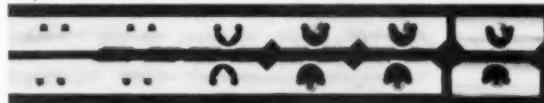


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Two strips of 19 gauge cold rolled steel, $\frac{3}{4}$ " wide are fed simultaneously into a 6 station scrapless die. Pilots are not used. A Model 68-A, U. S. Slide Feed and Stock Drag, arranged for multiple feeding produces 120,000 perfect parts per 8 hour day.

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new concept in Lathes



buy REGAL with manual shift..

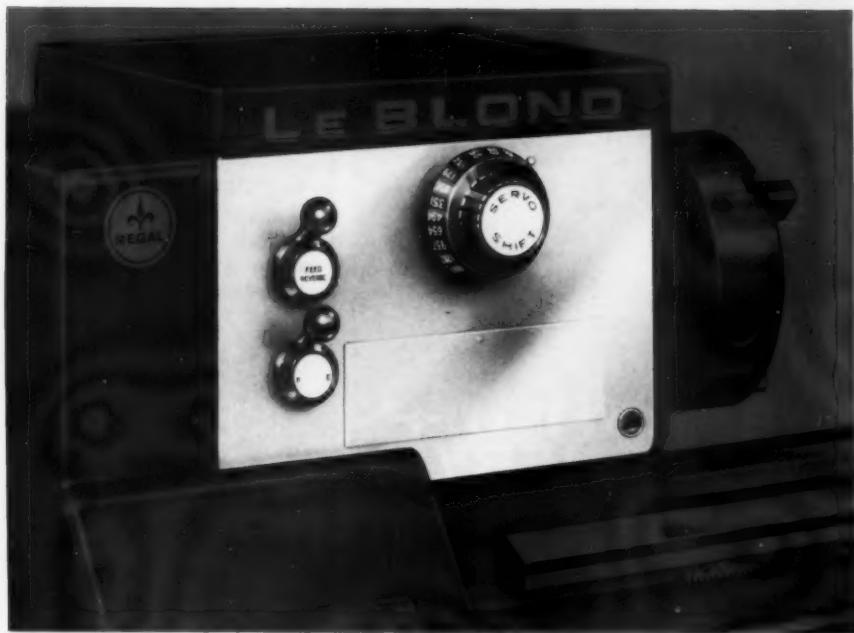
Are you dubious about the advantages of hydraulic shifting on small lathes? Ingenious design of the new LeBlond Regal headstock lets you start with manual controls and add hydraulics in your shop at any time in the future! It's like having your cake and eating it, too.

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Brand new Regal Servo-Shift makes speed changing faster and easier than ever before. You select your next spindle speed while still cutting.

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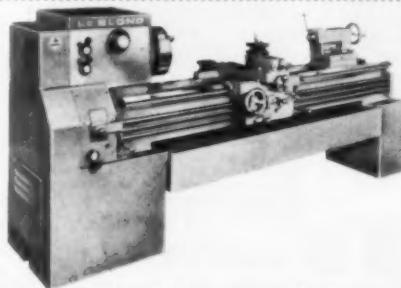
.....add SERVO-SHIFT later!

New LeBlond Regals are now available with 13", 15", 17" or 19" swing, and either manual or Servo-Shift.

*World's largest builder
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The R. K. LeBLOND
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October, 1961

97

Announcing

PINES
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Fully Automatic

TUBE CUT-OFF MACHINERY

4500 TO 6500 PIECES PER HOUR

Pines-Grieder Cut-Off Machines cut round tubing up to 4" diameter, with wall thickness up to .250", and will handle rectangular or other tube shapes. Any length is cleanly cut with extreme accuracy . . . dual shear cut eliminates tube-end distortion. Cuts steel, stainless, and non-ferrous metals in 1/3 second cycle time. With feed speeds to 600 ft. per minute, length of piece determines production rate. Tooling quickly and easily changed for various tube sizes.

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AUTOMATIC LOADER AND FEEDER for Pines-Grieder cut-off equipment. Feeds operator by automatically feeding up to 15,000 lbs. of stock in lengths to 22' through the machine. These units are also suitable for feeding other types of equipment.

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Specialists in Tube Fabricating Machinery
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* NEWS NOTE: GRIEDER INDUSTRIES, INC. HAS BEEN MERGED INTO PINES, PIONEER BUILDERS OF QUALITY BENDING EQUIPMENT.

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Meetings and Conventions

October 4 - 6, Annual Meeting, American Machine Tool Distributors' Association, Penn-Sheraton Hotel, Pittsburgh, Pa. Information: AMTDA, 1500 Massachusetts Ave., Washington 5, D.C.

October 12 - 15, Membership Meeting, National Screw Machine Products Association, The Greenbrier, White Sulphur Springs, W. Va. Information: MSMPA, 2860 E. 130th St., Cleveland 20, Ohio.

October 16 - 18, Machine Tools Industry Conference, American Institute of Electrical Engineers, Rockford, Ill. Information: AIEE, 30 W. 39th St., New York 18, N.Y.

October 17 - 19, 8th Joint Lubrication Conference, American Society of Lubrication Engineers, Hotel Morrison, Chicago, Ill. Information: ASLE, 5 N. Wabash Ave., Chicago 2, Ill.

October 23 - 27, 43rd National Congress and Exposition, American Society of Metals, Cobo Hall, Detroit, Mich. Information: ASM, Metals Park, Novelty, Ohio.

October 26 - 27, Semi-annual Conference, American Society of Tool and Mfg. Engineers, Toronto, Can. Information: ASTME, 10700 Puritan Ave., Detroit 38, Mich.

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DRILLING MACHINE

Entirely new from the ground up . . . designed and built to give you the same consistent accuracy and extended service for which the complete 'Buffalo' drilling machine line is so well known.

Check These Features of the No. 20:

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'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.



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Sugarcane Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

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The diversification of precision machine tools manufactured by ELLIOTT are designed to fulfill your very specialized needs.

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DOUBLE HOUSING PLANERS ALSO BUILT FROM 8' X 4' X 3'.

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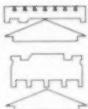
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When you think of **PRECISION**

For life time precision

Lucas provides

airlift to saddle



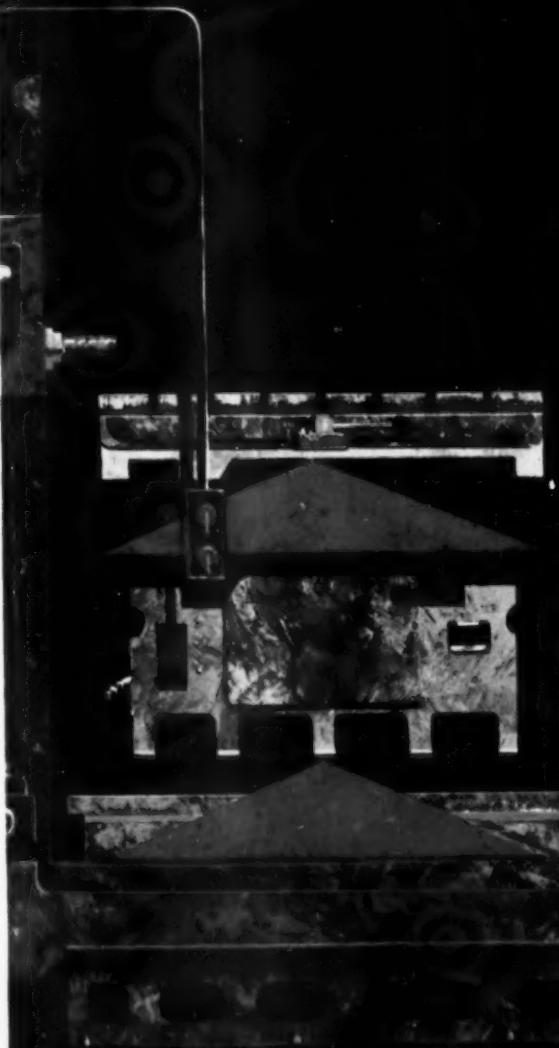
and table.

These elements are supported on a thin film of lubricated compressed air during traverse. This separation of metal from metal virtually eliminates wear. During machining cycles the saddle and table are automatically clamped down tight to provide absolute rigidity for even the heaviest cuts. Unclamping is automatic, too. These are two aspects of Lucas design which contribute to the precision of these machines. Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland, Ohio. When you think of Precision . . .

think of . . .



LUCAS
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When you think of **RELIABILITY**

Lucas automatic power positioning automatically repeats automatically repeats automatically repeats to $\pm .0001 \dots$

A simple, completely reliable system of dial indicators, end measures, and electrical controls automatically disengages rapid traverse, engages the fixed, constant-rate power feed and precision stops the unit at predetermined settings. Automatic power positioning assures the highest order of repetitive accuracy with an absolute minimum of operator attention.

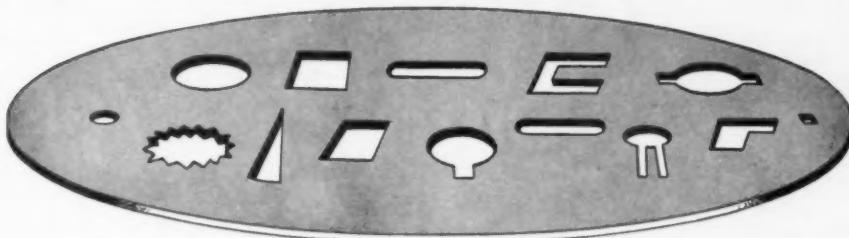
A new catalog describes our complete line of horizontal boring, drilling and milling machines. Write Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland, Ohio. When you think of Reliability . . .

think of . . .



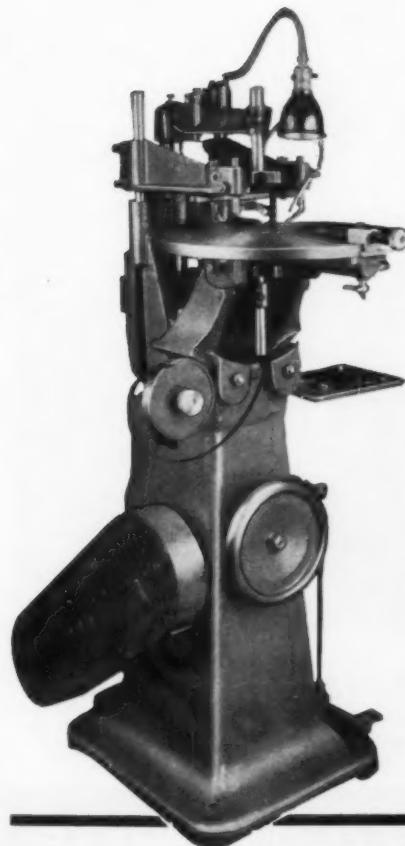
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Freak contours — more conventional shapes — internal or external forms. In any case, you'll save valuable time by producing the job on an Oliver of Adrian contour sawing and filing machine.

Parts for jigs and fixtures, dies, gages, templates and special machine production can be shaped to dimension faster — easier — at less cost. No hand filing or semi-finishing operations. Better investigate Oliver today. Just write. Available in five sizes — bench or pedestal.



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TRAVATROL

electronic

POSITIONING CONTROL

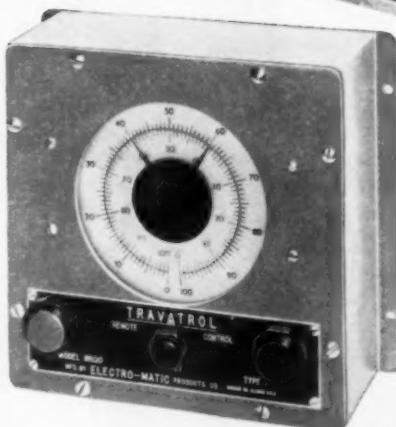
ELIMINATES DOGS



A LINEAR measuring and positioning control that eliminates the use of "dogs" on reciprocating machine beds, and traversing work heads.

A complete packaged unit with variable speed D. C. motor drive and three dimensional position systems. Available in a wide range of models.

TRAVATROL eliminates costly set-up time; it establishes and maintains a minimum distance of travel and point to point positioning over full range. Dual adjustments are provided for minimum and maximum travel range.



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- Larger Base
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- 10-Spline Spindle

FOREMOST

**Model 1150
Drill Press**

Variable Speed Range

475 to 4800 rpm

**FIVE SPEED
STEP PULLEY**

SPEEDS . . . 400 . . . 840 . . . 1580 . . . 2800 . . . 5300
RPM. Featuring cast aluminum alloy step pulleys and large
guard for easier belt changing. Economy priced, it's ideal
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POPE

SPECIAL PURPOSE PRECISION MOTORS

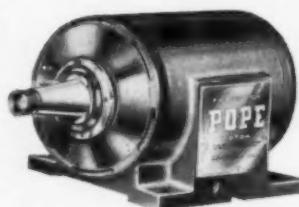
For Your Motor Applications that require Low Amplitude of Vibration, Extra Rigidity, and Special Shaft Extensions. Arranged to operate in Horizontal or Vertical Position, or as you specify.

Pope P-19000 Series Heavy Duty Precision Motors. Straight or tapered shafts

1 to 20 HP — 900 to 3600 RPM

.000025" (twenty five millionths) vibration amplitude

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Pope P-929-ASA — 1 to 20 HP — 900 to 3600 RPM motorized spindle for heavy duty ball bearing raceway grinding.



Pope P-3283 motorized cartridge type spindle for vertical or horizontal boring mills or turret lathes. 1 to 20 HP — 900 to 3600 RPM and High Cycle.

Coolant Connection



Pope P-2500 Series heavy duty motorized spindles, 1 HP to 20 HP — 900 to 3600 RPM, for surface grinding, boring, and milling.



Pope P-922 super precision double-end totally enclosed motorized grinding head for producing low micro-inch surface finishes and accurate parts. 1 to 3 HP.



Pope P-6651-B Precision 1 to 3 HP motorized angularly adjustable head for tool and cutter grinders and special machines, such as blade grinders.



Pope P-16121 10 HP motorized, heavy duty deep hole (72" long) spindle for ID and OD grinding of large workpieces.



Pope P-506-B High Cycle motorized spindle for grinding and milling up to 100,000 RPM; water cooled, oil mist lubricated.



Pope P-19162-AN "Anocut" electrolytic motorized grinding spindle, 1 to 20 HP; arranged to transmit from 50 up to 3000 amperes, at speeds up to 18,000 RPM.

Pope Motorized Spindles on special and automated machines assure you of continuous production of accurate parts. May we quote on your requirements?

No. 136

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Established 1920

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MACHINE and TOOL BLUE BOOK



**IMPROVE YOUR
CUT-OFF JOBS...**

USE THE RIGHT

BARNES Power Hacksaw BLADE

Barnes produces four distinctly different Power Hacksaw Blades . . . one of these famous Barnes blades is "best" for your particular job.



BARNES-WELD



ROCKET



SERVICE



RED ARROW

Each blade is made to rigid, high quality standards from selected steels for maximum on-the-job performance.

Call your Barnes Distributor today for immediate savings! He and the Barnes Sales Engineer have the experience and training to help you select the right blade for best cutting efficiency.

While these trained men are in your plant, have them check your hand blade and hole saw requirements! The right Barnes hand blade and hole saw will give you important savings, too!

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HACKSAW BLADES
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HOLE SAWS



*Ever see a
magnetic chuck
hold non-magnetic
materials?*

Magna-Vise

makes it easy!

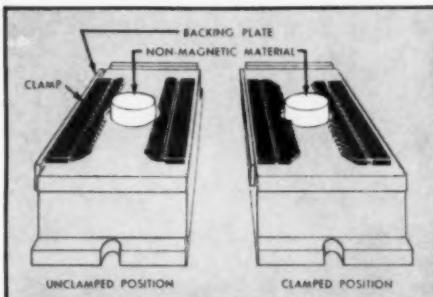
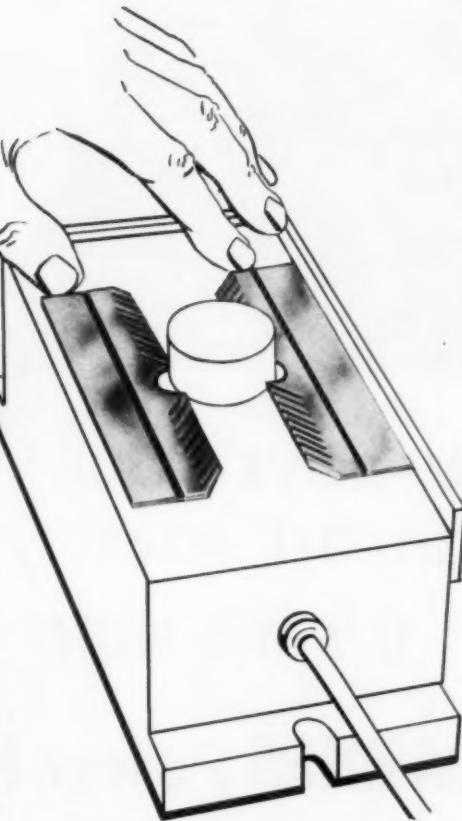
Helps you get more use from your magnetic chucks. Lets you use them to hold all kinds of non-magnetic materials. Eliminates cumbersome fixtures, reduces set-up time and costs.

Here's all you do: (1) Place Magna-Vise on de-energized chuck. (2) Place work-piece between Magna-Vise jaws. (3) Energize chuck. Magna-Vise jaws drawn down against chuck surface and sides of work-piece, hold it rigidly in place. (4) To remove piece, de-energize chuck.

Once you've used Magna-Vise you won't want to be without it.
ORDER YOURS TODAY.

Patent No. 2477297

Model	Length	Width Jaws	Thick	Price
6	6 $\frac{3}{8}$ "	1 $\frac{1}{8}$ "	$\frac{3}{16}$ "	\$32.00
6A	6 $\frac{3}{8}$ "	1 $\frac{1}{8}$ "	$\frac{1}{16}$ "	\$35.00
10	10"	1 $\frac{1}{8}$ "	$\frac{3}{16}$ "	\$42.00
14	14"	1 $\frac{1}{8}$ "	$\frac{9}{16}$ "	\$60.00



MAGNA-LOCK INC., Big Rapids, Mich.

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how one simple change jumped production 105%

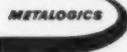
Look at the long slot that runs the length of this typewriter adapter shaft. It was giving Standard Register Co. a costly production headache. Tubing used could only be milled at $7\frac{1}{4}$ " per minute. Finish was poor. Warping and twisting ran rejects to 25%.

Then Ryerson studied the situation and suggested a change in material—to Ledloy® 170 tubing. Using the same tooling, Standard now mills $15\frac{1}{2}$ " per minute—more than double former production. And rejects dropped to zero—the slot is smooth and straight as a die. See for yourself.

How about you? Shouldn't you invite this kind of close look at the material in your products, equipment and plant? A Ryerson specialist may well help you boost production and cut costs in some ways you never thought of. Metalogics is like that.

RYERSON

JOSEPH T. RYERSON & SONS, INC., MEMBER OF THE  STEEL FAMILY



PLUS VALUES IN STEEL • ALUMINUM • PLASTICS • MACHINERY

October, 1961

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109





B
B

Tractors, combines, and cultivators . . . balers, harrows, and corn pickers . . . seeders, spreaders, and tillers . . . diesel engines, axles, and transmissions . . . these, and many other agricultural implements bearing the Massey-Ferguson trademark flow out of more than two dozen plants scattered around the world. From a modest beginning 114 years ago, the company today is a giant in its field.

Manufacture Abroad?...

In an interview with BLUE BOOK's editor at corporate headquarters in Toronto, Massey-Ferguson's capable and ubiquitous manufacturing vice-president, H. A. Wallace, spells out the challenge of building farm equipment on a global scale.

Q. What is the scope of your manufacturing activity?

A. We are truly an international company. We have five plants in Canada, four in the United States, six in England, three in France, one in Germany, two in Italy, two in Brazil and two in Australia. An associated company builds our farm implements in South Africa. Sales this year will be about \$500,000,000.

Q. Is each site self-sufficient or are your manufacturing efforts co-ordinated?

A. Probably only our diesel engine plant in Peterborough, England, could really be considered self-sufficient. Our other operations are highly integrated. Tractor components made in Coventry, for example, are shipped into Detroit for assembly. We ship assemblies and subassemblies in various conditions—completely knocked down, and partly knocked down.

Q. What advantages are there in building farm implements all around the world?

A. The seasons are different all over the world. When we have summer

here in Canada, we have winter in Australia. One of the advantages of being an international company is the fact that while the production requirements of the individual factories around the world go up and down with the seasons to a certain extent, our ability to ship between factories gives us a better chance to level off our production everywhere. Manufacture of equipment for a highly seasonal industry such as farming does not lend itself to long runs. Except for our high-volume tractor business, we have to limit ourselves to almost custom building.

Q. Are other farm equipment manufacturers organized internationally as you are?

A. Not quite. Only International Harvester and Ford have done very much along those lines. But they ship complete tractors, not components, as we do.

Q. Are there any design differences in the same implements made in different locations? After all, farming is farming all over the world.

A. That isn't quite true. There are specific conditions to be dealt with in every locale. One of the advantages in having manufacturing plants in different parts of the world is that we can better meet local requirements. We are interested, of course, in standardizing as much as possible throughout the world. I know that I will never live to see complete standardization. The difference between the inch-pound system and the metric system, for example, makes this impossible.

Where parts from a metric-system country must be shipped to a plant in a non-metric-system country, the draw-

ings must first be translated. Anyway, we do not ship thousands of parts which have to be assembled. We ship subassemblies. We do not ship items around the world, like sheet metal, which is bulky and is easy to buy locally.

Q. Have you any favorite manufacturing site? Is there any community or government you feel is particularly congenial and encouraging to industry?

A. In my job I cannot afford to allow any particular installation to become a favorite. There are advantages and disadvantages to manufacturing everywhere.

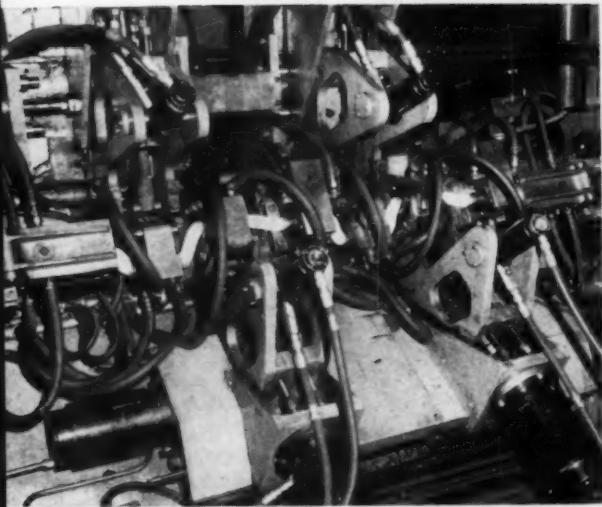
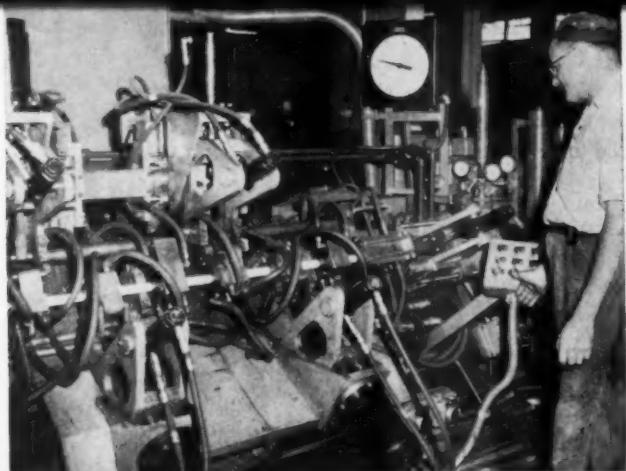
Q. How would you rate U.S. production techniques with those you find elsewhere?

A. I'm not ready to admit that America has all the answers to production, or even that its techniques are superior. True, it puts more money into production equipment than anyone else. But there are fine manufacturing brains everywhere.

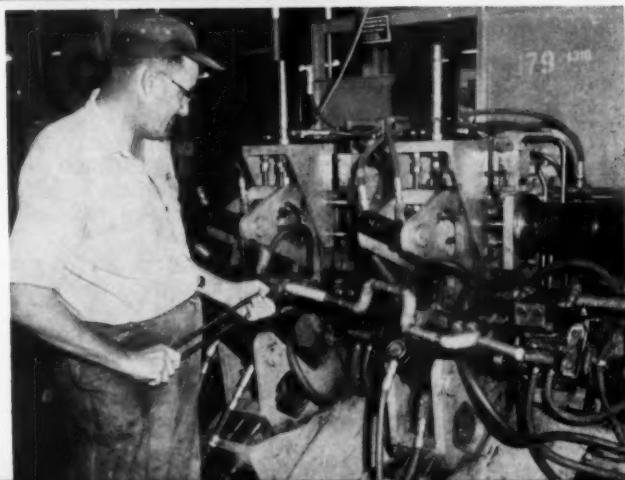
The amount of tooling you do in a country depends on the cost of labor. If labor is expensive, you have to tool to meet your costs. If labor is not expensive, then you can afford to operate on a lesser investment in tooling.

Q. Do you let each plant develop its own manufacturing methods, or do you from your headquarters here in Toronto direct this activity? Or are you just interested in the quality of the end product?

A. Of course I'm interested in the end product, and I strive constantly for uniform high quality throughout the world. But I'm very interested in



Typical of Massey-Ferguson manufacturing ingenuity is this company-designed bending machine. It forms the six throws in a crank operating the straw walker of a combine. Bar stock for the crank is automatically clamped hydraulically and induction heated (upper view). The clamps then execute a twisting movement to produce the throws (center view). Completed crank is removed at end of cycle (lower view).



exactly how the products are manufactured everywhere.

Our quality standards are identical for all our plants. Things like surface finishes, quality of welding, strengths, and appearance must be uniformly obtained throughout the world, and often with quite different material and equipment.

Q. What means of communication are there to assure this uniformity?

A. There are various ways. There is an interchange of personnel, on a temporary basis, between factories and operating units. We have periodic world-wide manufacturing conferences, where there is direct contact between the production engineers. Actually, our corporate manufacturing staff is the kingpin in our effort to maintain both uniformity and quality.

Q. How is this staff organized?

A. I do not have a very large staff. Our organizational philosophy is not to have big corporate staffs. In our headquarters here, I have a general quality-control manager, a general industrial engineering manager, a general facilities planning manager, and a general operations analysis manager. These people have counterparts for our European operations in our London headquarters.

These staff jobs are very difficult assignments. The men have to be skilled diplomats, since they have to continually sell themselves to the local personnel. They're traveling about 50 per cent of their time. I myself travel from 60,000 to 75,000 miles a year. You have to like your job . . . you have to be a bit of a gypsy . . . you have to get along with marks, sterling, and liras. • • •



. . . about Harold A. Wallace

Born in Indiana, son of a superintendent of a large road-building outfit, Hal Wallace worked as a waterboy, laborer, mule Skinner, steam shovel fireman, steam shovel operator, and finishing foreman. Along with this practical experience he acquired a distinctive formal education, attending evening classes while completing an apprenticeship at Allis-Chalmers, becoming a journeyman tool and die maker in 1930. He was graduated with honors with a B.S. in engineering from the University of Illinois, working his way through college as research assistant in the materials-testing laboratory.

Joining Allis-Chalmers in 1934, Mr. Wallace traveled world-wide installing, testing, and repairing all types of heavy mechanical and electrical machinery. Subsequently, he was superintendent of transportation; superintendent of maintenance and tools; and production manager, General Machinery Division, West Allis Works.

In 1947 he went to Johnson Suture Corporation as plant manager; in 1949 to Ethicon, Inc., New Brunswick, N.J., a wholly-owned subsidiary of Johnson & Johnson, as vice-president of manufacturing and director. He joined Massey-Harris-Ferguson in December 1956 (now Massey-Ferguson) and was appointed vice-president, manufacturing. Last year he was elected a director of the company.


B
B

How Good is a Diamond Wheel for Grinding High-Vanadium Steel

■ Evidence showing advantages in application of man-made diamond wheels to grinding the more resistant high-vanadium, high-speed, and die steels is accumulating. As much as 50% saving in total cost, stock removal up to 60% faster, and greater ease of holding dimensional precision are some of the benefits claimed. In the softer tool steels, there is a gain in ease of holding dimensional accuracy and/or flatness, which may favor the use of the slow-wearing diamond wheel over the abrasive wheel, even though total cost of stock removal per cubic inch is equivalent or higher.

Extreme difficulty in grinding to required tolerances at reasonable rates with conventional wheels has been one of the deterrents to greater use of the higher-vanadium tool steels (over 3% vanadium). Wear of abrasive wheels is so great that it is difficult to obtain flatness in surfacing operations or to hold diameters in cylindrical grinding. The reason: Vanadium carbide is nearly as hard as aluminum oxide.

For diamond wheels to be considered for grinding high-vanadium



tool steels, the total cost of finishing a piece must be competitive with aluminum-oxide wheels. How can this possibly be, when a diamond wheel costs about 150 times as much as an aluminum-oxide wheel? The findings which follow, while obtained in the laboratory of the Metallurgical Products Dept., General Electric Co., have been confirmed in the field on an increasing number of individual jobs, and indicate substantial over-all savings with the use of diamond wheels.

Test Program

A number of high-vanadium steels were tested, as well as several low-vanadium, relatively easy-to-grind steels, the compositions of which are shown in Table 1.

The best wheels were a 100-grit vitrified, man-made diamond wheel, 7" in diameter, $\frac{1}{2}$ " wide; and a 60-grit, semi-friable aluminum-oxide wheel 8" in diameter, $\frac{1}{2}$ " wide. The 60-grit aluminum-oxide wheel is, of course, one of the most popular for stock removal operations on steels of this type. The test block, 6" long by 1" wide, was surfaced longitudinally on a 6" by 18" horizontal-spindle surface grinder. A 1:100 emulsion of soluble oil was used as the grinding coolant.

Test conditions consisted of a wheel speed of 6000 sfm, a table speed of 60 sfm, a unit downfeed of .001" per completed crossfeed, and a crossfeed of .050" per pass.

After the diamond wheels were trued with a brake-controlled device, they were conditioned by preliminary grinding in which total downfeed was

.010". Test runs involved a total downfeed of .100" for diamond wheels and .020" to .030" for the aluminum-oxide wheels, depending upon wear rate. Aluminum-oxide wheels were trued with a diamond dresser. Wheel wear and stock removal were measured with a micrometer after each test.

The cost figures used for the comparisons were as follows:

Diamond wheel cost—	\$ 568.00
Aluminum-oxide wheel cost—	\$ 3.43
Labor plus overhead rate—	\$ 10.00/hr.

Test Results

As shown in Table 2, a lower total cost when grinding with the diamond wheel was indicated for six of the test steels: BR-3, Ottawa 60, and AISI grades T-15, M-4, D-7 and M-3. The D-2, even though a free-machining type, was a borderline case, as was the M-7.

The same data appear in the accompanying bar charts. From the groupings by type of steel, it will be observed that for all the die steels, diamond-wheel grinding is equivalent or more economical, the differential increasing substantially with vanadium contents of 4% or greater. The same pattern exists with the molybdenum-base high-speed steel types; vanadium contents of 3.2% or greater are more economically ground with diamond wheels.

The exception to the general observation that with a vanadium con-

TABLE 1 COMPOSITION OF STEELS EVALUATED

AISI No.	Trade Name	Manufacturer	Hardness				Composition					
			Rc	V	C	Cr	Mn	W	Mo	Co	Si	
—	BR-3	Latrobe	64	4.5	2.8	5.3	.7	—	1.1	—	.3	
—	Ottawa 60	Alleg. Ludlum	67	12.0	3.2	1.0	—	—	1.0	—	—	
T-15	Vasco Supreme	Van. Alloys	68	5.0	1.5	4.8	.3	12.5	—	5.0	.3	
M-4	Neatro	Van. Alloys	66	4.0	1.3	4.5	.3	5.5	4.5	—	.3	
D-7	BR-4	Latrobe	65	4.0	2.3	12.5	.4	—	1.1	—	.4	
M-3	Crusader XL	Latrobe	67	3.2	1.2	4.1	.3	6.0	6.0	—	.3	
D-2 (FM)	Olympic FM	Latrobe	64	1.0	1.5	12.0	.5	—	.8	—	.3	
M-7	Tatmo V	Latrobe	64	2.0	1.0	3.8	—	1.8	8.8	—	—	
T-9	Rex 4V	Crucible	66	4.0	1.2	4.0	—	18.0	—	—	—	
T-6	Rex 440	Crucible	65	1.5	.8	4.5	—	20.0	—	12	—	
M-2 (FM)	DBL-2-EZ	Alleg. Ludlum	65	1.8	.8	4.0	—	6.0	5.0	—	.3	

TABLE 2 COMPARISON OF TOTAL COST TO GRIND ONE CUBIC INCH OF STEEL: DIAMOND WHEELS VERSUS ALUMINUM-OXIDE WHEELS

AISI Type	% Vanadium	Grinding With Diamond Wheel			Grinding With Aluminum Oxide Wheel		
		Labor Cost/ Cubic Inch	Wheel Cost/ Cubic Inch	Total Cost	Labor Cost/ Cubic Inch	Wheel Cost/ Cubic Inch	Total Cost
BR-3	4.5	\$15.22	\$ 3.31	\$18.53	\$34.60	\$.63	\$35.23
Ottawa 60	12.0	15.60	6.80	22.40	38.20	.91	39.11
T-15	5.0	14.90	12.40	27.30	38.50	.86	39.36
M-4	4.0	16.00	10.50	26.50	29.90	.55	30.45
D-7	4.0	16.10	4.05	20.15	22.20	.26	22.46
M-3	3.2	14.10	11.07	25.17	27.30	.41	27.71
D-2	1.0	15.90	1.35	17.25	17.00	.05	17.05
M-7	2.0	15.60	13.45	29.05	26.80	.38	27.18
T-9	4.0	13.10	19.86	32.96	24.50	.41	24.91
T-6	1.5	13.60	9.90	23.50	16.90	.15	17.05
M-2	1.8	16.90	14.91	31.81	17.70	.06	17.76

TABLE 3 GRINDING RATIO: CUBIC INCH OF STEEL REMOVED PER CUBIC INCH OF WHEEL WEAR

AISI Type	% Vanadium	Diamond	Aluminum Oxide	Ratio Relative Diamond to Aluminum Oxide	
				Aluminum Oxide	Relative Diamond to Aluminum Oxide
BR-3	4.5	124.9	.49		254:1
Ottawa 60	12.0	60.8	.34		197:1
T-15	5.0	33.2	.36		92:1
M-4	4.0	39.2	.57		69:1
D-7	4.0	102.0	1.18		86:1
M-3	3.2	37.3	.86		43:1
D-2 (FM)	1.0	306.0	6.44		47:1
M-7	2.0	30.7	.81		38:1
T-9	4.0	20.8	.85		24:1
T-6	1.5	41.7	2.09		20:1
M-2 (FM)	1.8	27.7	5.35		5:1

tent of 3% or greater diamond grinding is competitive exists in the case of the tungsten-base high-speed steels. This is undoubtedly a function of vanadium carbide volume, which is somewhat less in the tungsten-base high-speed steel system. Further exploration of these variables is anticipated to define more accurately carbide particle size and volume and grinding characteristics.

Grinding Ratio

The grinding ratio, a measure of the ease of grinding a material with a given wheel, is the ratio of cubic inches of material ground per cubic inch of wheel wear. Table 3 shows the great difference between the relative wear rates of the diamond wheel compared to the aluminum-oxide wheel. Note that for the BR-3 die steel the grinding ratio of the diamond wheel is over 250 times that of the aluminum-oxide wheel, whereas it is only five times the efficiency of the aluminum-oxide wheel for the M-2 steel.

It is interesting to observe that the free-machining characteristics of steels D-2 and M-2 improves grinding efficiency with both types of wheels. In the case of steel D-2 which is easiest to grind with both wheels, it is not possible to assign the effect primarily to the alloy sulfides contained in the steel, since it is also the lowest in vanadium content.

Surface Finish

Surface finish measurements were made on each steel after grinding with

both type wheels under the standard conditions of downfeed, crossfeed, and table speed. Measurements taken transverse to the direction of the table travel show little consistent difference in the degree of finish. On some steels the 100-grit diamond wheel produces the better finish; on others, the reverse is true, with the 60-grit aluminum-oxide wheel producing a better finish. In general the finish on the tool steels is similar to the finish expected on tungsten carbide ground with a diamond wheel of this type.

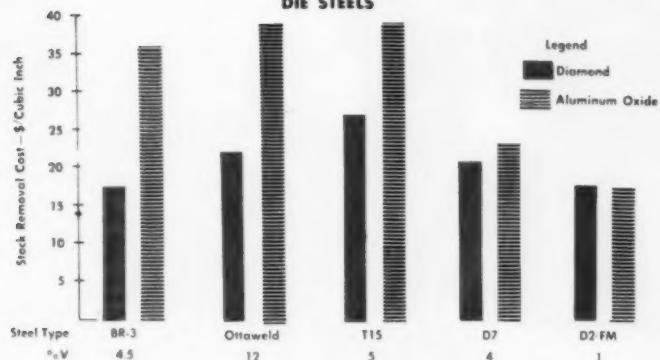
Conclusions

Although these results are based upon laboratory grinding comparisons alone, an increasing number of shops are using diamond wheels in grinding the high-vanadium tool steels. In most job-shop operations, a variety of steels are ground on a particular machine tool, and it is not possible to obtain quantitative comparison data. But the diamond wheel continues to find increasing acceptance, since in many cases it enables the finishing operation to be carried out more quickly to close tolerances thereby freeing the machine for additional operations.

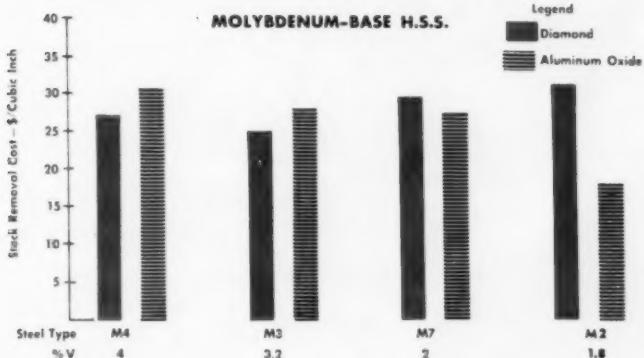
It must also be recalled that the diamond wheel bond used in these tests, although one of the best for grinding cemented carbide, was not developed specifically for tool steel grinding. Greater efficiency through additional bond development may be expected, as well as additional benefits in productivity or total cost reduction from the utilization of electrolytically assisted techniques.

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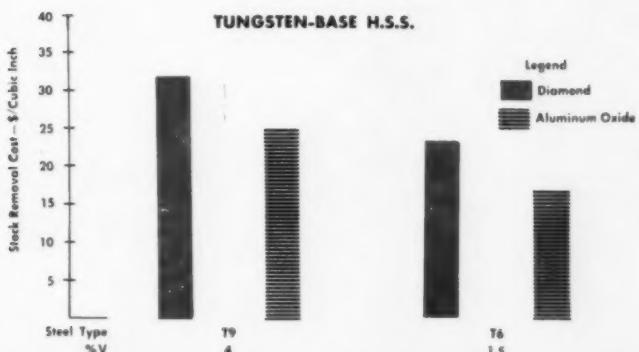
DIE STEELS



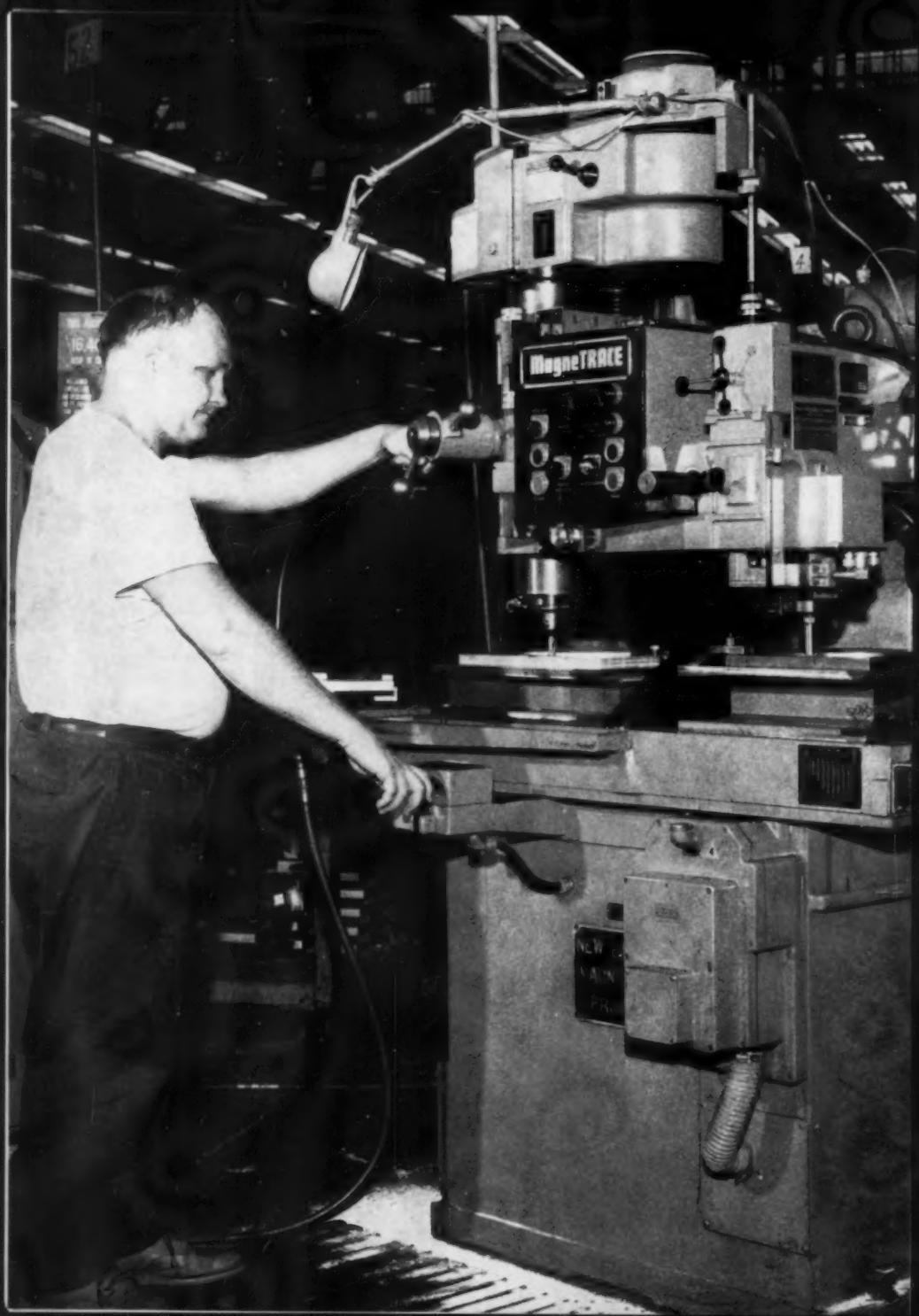
MOLYBDENUM-BASE H.S.S.



TUNGSTEN-BASE H.S.S.



Comparative costs of grinding different vanadium-content steels with diamond and aluminum-oxide wheels.





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Tracing Ain't Dead Yet!

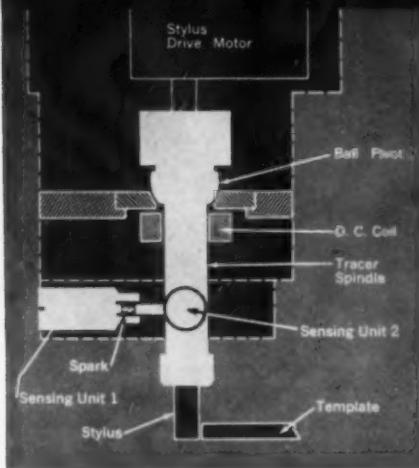
By **J. M. Burnette, Jr.**
Senior Manufacturing Engineer
North American Aviation, Inc.
Columbus, Ohio

■ Newest development in the art of profiling is a tracer system which uses magnetic force to maintain contact between the stylus and the template. The system, which functions automatically, replaces the "joy stick" manual control of the conventional profiler. Of significance is the fact that template tracing is given greater refinement at a time when a good deal of attention is being paid to numerically controlled contouring systems which completely eliminate templates.

At the Columbus (Ohio) Division of North American Aviation, Inc., three of these Magnettrace automatic profilers are handling a variety of two-dimensional work.

Operating Principle

Directing the movement of the cutter spindle and work table are three



1. Principle of the Magnettrace control system. As the stylus rotates, it is attracted to the template. The small amount of deflection—.0001" to .0002"—is sufficient to activate system.

servo elements: a tracing unit, an electronic amplifier, and a dual servo drive system. The three are joined electrically and mechanically in a closed-loop system.

Details of the tracing unit appear in Fig. 1. The stylus, mounted in the tracer spindle, is on a ball pivot and is free to swing in any direction. A direct-current coil surrounds, but does not touch, the tracer spindle. This coil magnetizes the stylus by induction, and causes the stylus to cling to the template, which is made of mild steel. Two sensing units incorporate electrodes which control the longitudinal movement of the profiler table and the transverse movement of the cutter spindle head.

A small, variable-speed motor rotates the traced spindle at a pre-selected rate. As the tracer stylus rotates against the edge of the template, it tends to tilt the tracer spindle away from vertical. Any minute deflection changes an "error" signal which instantaneously calls for cor-

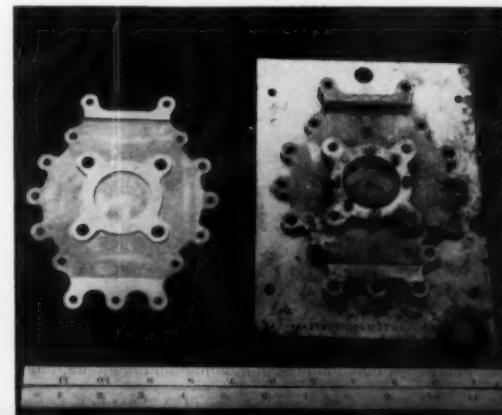


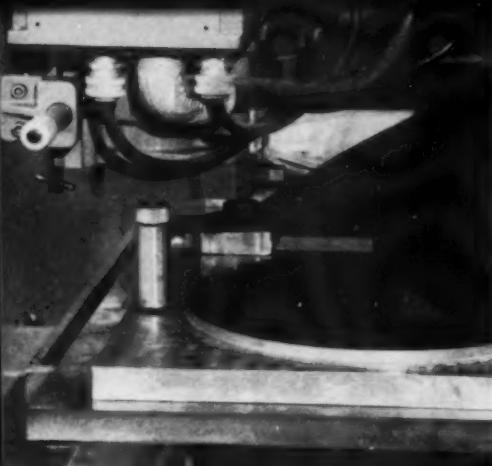
2. Work table moves longitudinally and cutter spindle head moves transversely. Movements in both axes are directed through double spur gears having opposing tension to eliminate backlash.

rective movements of the table and cutter spindle head. This "error" signal arises when movement of the stylus and tracer spindle changes the spark gap between the electrodes. Voltage across the gap is proportional to the size of the gap and becomes the input "error" signal which is transmitted to the electronic amplifier.

The amplifier has two circuits, each of which receives a signal from one

4. Aluminum fuel fitting (left) and profiling template. Magnettrace operation consists of a roughing cut around each offset with a $\frac{1}{4}$ " end mill, then a clean-up of all radii with a $\frac{1}{8}$ " end mill.





3. The feed rate is controlled by the speed of rotation of the stylus against the template. Since the feed rate remains constant as preset, the machined surface is free of tool marks.

of the two electrode sensing units. The amplified signal is fed to two magnetic clutches—one for each direction of movement—of the respective servo-drive.

Typical Applications

North American's three Magnettrace profilers handle a variety of two-dimensional production jobs. In Fig. 4 is shown a saddle tank defuel fitting (left) and its template. The part is

5. Stainless-steel fuselage support. Swarf (twist) of periphery is developed in series of passes with end mill, starting at bottom of part and stepping up .050" until top is reached. Maximum twist is .070" from vertical.

machined from $\frac{1}{4}$ " 2024 aluminum plate. Initial setup time is $\frac{1}{2}$ hour; profiling time, 5 min. per piece. Nominal size of end mill and stylus is $\frac{1}{8}$ ". Finish obtained: 63 micro inches.

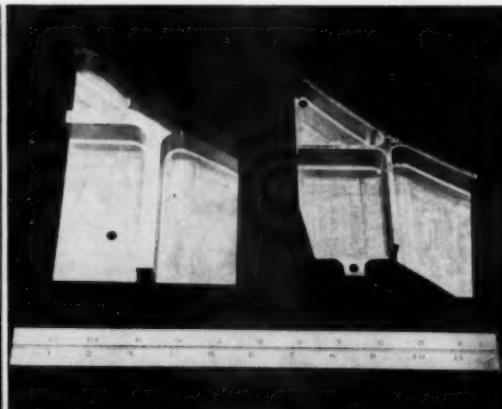
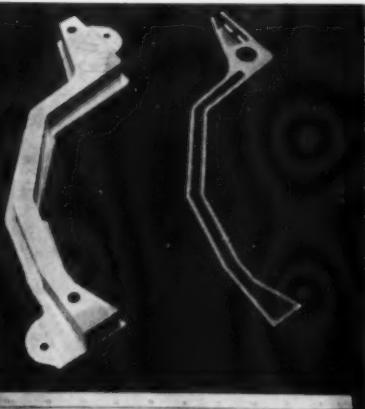
The fuselage support, Fig. 5, is made from A286 hot-rolled, stainless-steel plate. Each piece is first flame-cut out of the plate (left). Profiling involves producing a swarf (twist) in the periphery, and milling a slot along the center line.

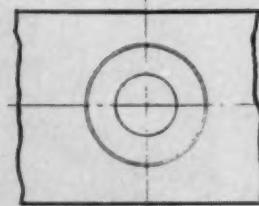
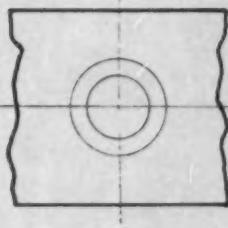
Several passes are made to develop the swarf, starting at the bottom and working up. A $\frac{3}{8}$ " end mill is used on the periphery. The slot, .280" wide, is cut with a $\frac{1}{4}$ " mill. Machined surfaces have a 125 micro-inch finish. Complete profiling time is 18 hours.

Another part involving a swarf cut is the splice fitting, Fig. 6. Work material is high-strength steel (Vasco Jet). In this instance, however, the cutter is ground to the swarf angle. The work is roughed out on a vertical milling machine in a preparatory operation (left). Parallel walls are produced with a $\frac{1}{4}$ " end mill.

• • •

6. High-strength steel splice fitting is roughed out on a conventional milling machine, then profiled along mold line with a cutter ground with a 3-degree swarf.

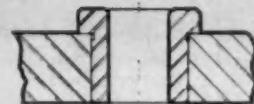




PRESS FIT BUSHINGS

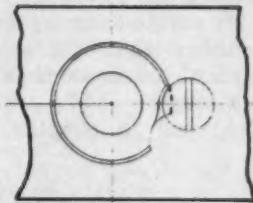
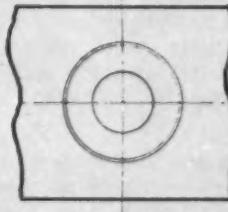


HEADLESS

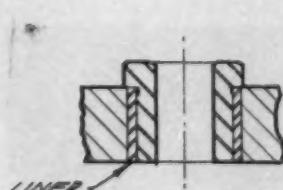


HEAD

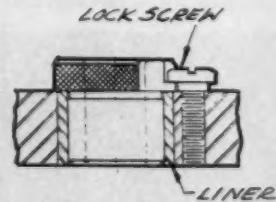
Getting the MOST from Jigs



RENEWABLE BUSHINGS



FIXED



SLIP

STANDARD COMMERCIAL JIG BUSHINGS

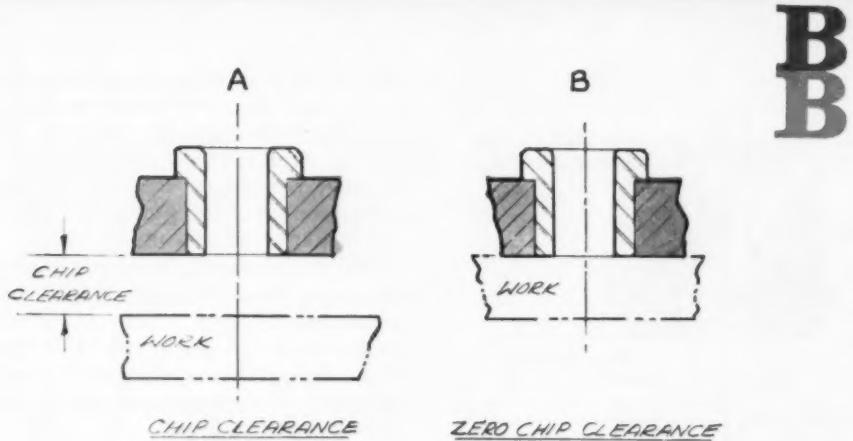


FIGURE 2

with the RIGHT Bushings

By Harold Sedlik
Stanley Tools
New Britain, Conn.

■ One of the most essential features of a good jig design is the selection of guide bushings. A cutting tool that is properly located and guided will inherently offer consistent results—the key to manufacturing interchangeable parts. What hardened steel guide bushing designs are available and how they are used are reviewed in this article.

Commercially available guide bushings are manufactured to conform to specifications of the American Standards Association. These bushings are made in two classes: press fit and renewable, Fig. 1. Press fit bushings, with or without heads, are installed directly in a jig without a liner. They are used principally for short or limited production runs where bush-

ing replacement is unnecessary or where the center distance between holes is too short to permit installation of liners or renewable bushings.

Renewable bushings are used in liners which are directly installed in jigs. They are employed when it is estimated that the bushing will wear out or become obsolete before the jig is discarded or when several bushings are to be interchanged. Renewable bushings are made in two classes: fixed and slip. Fixed renewable bushings are generally used with the intention of leaving them in place until worn, while slip renewable bushings are interchangeable in a given size liner. To facilitate removal, slip renewable bushings usually have knurled heads.

Selecting the bushing

To maintain proper alignment between tool and bushings, the guide

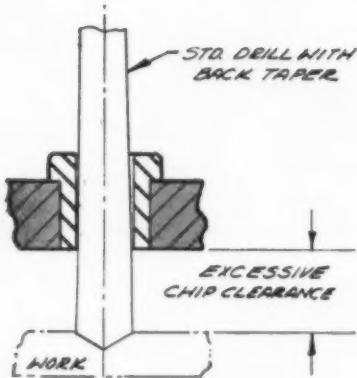


FIGURE 3 AVOID THIS CONDITION

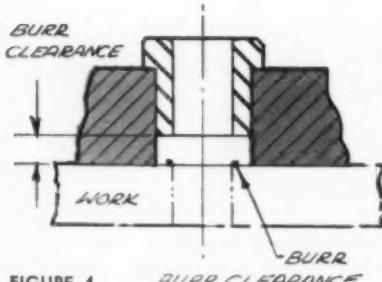


FIGURE 4 BURR CLEARANCE

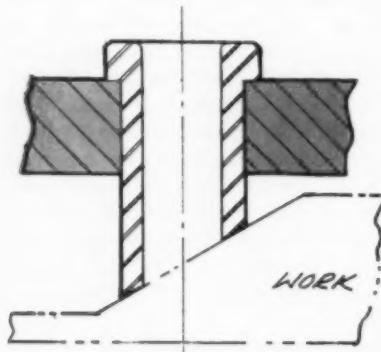


FIGURE 5

hole length through the bushing should not be less than $1\frac{1}{2}$ times its diameter and seldom greater than $2\frac{1}{2}$ to 3 times its diameter. When the guide bushings are greater than the above, cutting tools will heat, clog with chips and breakage will eventually result.

Where long bushings are necessary, the guide hole diameter should be counterbored from 10% to 20% greater than the guide hole and the larger hole must be continued from the mouth of the bushing to where the guiding diameter begins.

Chip control is a matter of prime importance inasmuch as guide bushings are concerned. Fig. 2A illustrates chip clearance, the space between the work and guide bushing. The advantages of adequate chip clearance is that it allows chips to escape from under the bushing, thereby minimizing the wear of the abrasive chip action on the bushing. For proper chip control results, the clearance space should be equal to at least the bushing guide hole diameter. However, too much chip clearance will defeat the purpose of a guide bushing. Standard cutting tools such as drills and reamers, have back taper—that is, they are slightly larger in diameter at the cutting end; the greater the distance the work is from the guide bushing, the more inaccuracies and tool deflection multiply, Fig. 3.

Zero chip clearance (Fig 2B) provides a maximum guiding effect, since the bushing is as close to the work as is practical. Zero chip clearance is recommended wherever accurate alignment is desirable. However, the use of zero chip clearance has two disadvantages: The abrasive action of the chips in the bushing causes excessive wear. Also, a relatively deep hole

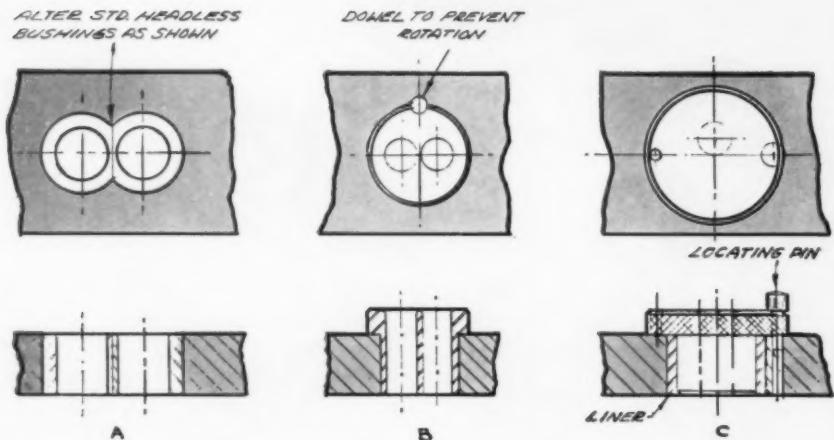


FIGURE 6

effect is secured. The bushing creates a hole equal to its depth, resulting in additional difficulties in chips disposed.

When drilling wiry metals, such as copper, in a plate jig, a burr clearance space is required at the lower end of the guide bushing where the drill enters the work, Fig. 4. This space will prevent the jig from being forced upward by the burr edge that is created around the drilled hole. The clearance should be equal to one half the guide hole diameter.

Special guide bushings

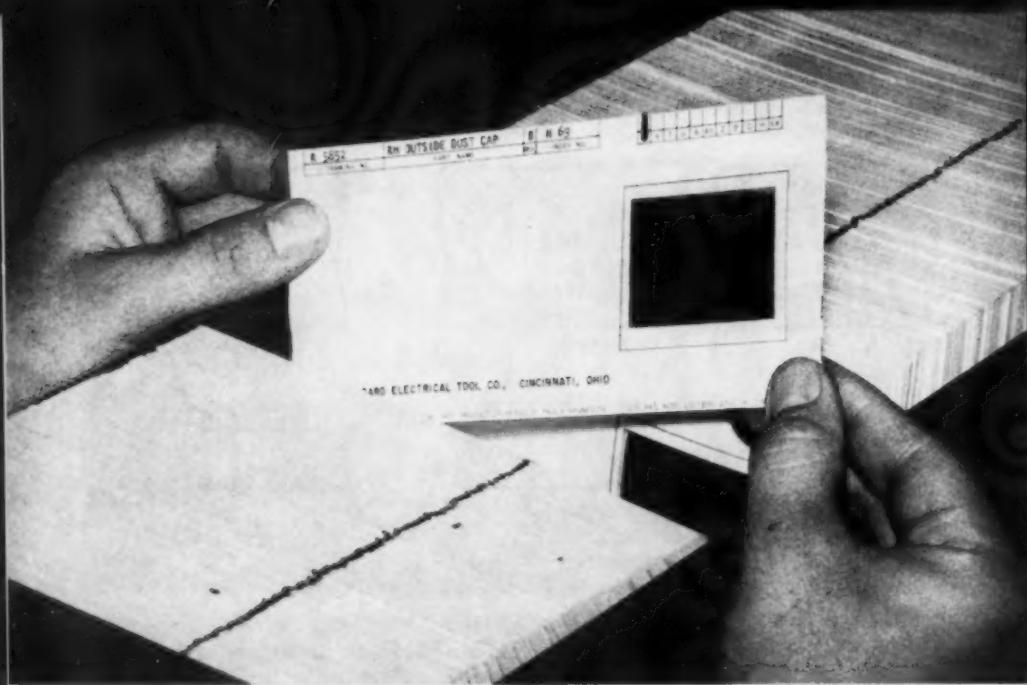
In general, the length of a special bushing should be approximately $1\frac{1}{2}$ to 2 times the guide hole diameter. Should a longer bushing be required, counterbore the guide hole as previously explained. Wall thickness must not be less than $\frac{3}{64}$ " for bushings with guide holes up to $\frac{1}{4}$ " diameter. For guide holes above $\frac{1}{4}$ " diameter, wall thickness should be $\frac{1}{16}$ " or

greater. Whenever feasible, special bushings should maintain specifications of the American Standards Association.

Fig. 5 illustrates the use of a special drill guide bushing ground to fit the contour of the work. This type of bushing is employed to reduce tool breakage and increase accuracy of hole location when drilling into a surface that is not perpendicular to the bushing guide hole.

It is frequently necessary to drill, two or more holes having very close center distances. Should it be apparent that standard guide bushings will not fit due to wall thickness, they can be modified by grinding flats on each bushing, Fig. 6A. For holes requiring closer center distances not possible with the above method than two or more holes can be placed in one large bushing as in Fig. 6B, or one hole is located in an eccentric bushing, as shown in Fig. 6C. This eccentric bushing is then rotated 180° for drilling the second hole.

• • •



Individual frames of microfilm are contained on Filmsort aperture cards, at Standard Electrical Tool Co., for easier retrieval and filing. Cards are indexed according to part number, classification, and other pertinent data.

For rapid retrieval . . .

Card Mount Microfilmed Drawings

■ Microfilm can be used profitably by medium-sized manufacturing concerns to relieve the problem of storage and retrieval of engineering drawings. Its use by other than large, complex industrial corporations is the result of the development of new equipment and techniques.

Representative of the medium-sized manufacturer is Standard Electrical Tool Co., Cincinnati. With some 20,000 to 25,000 engineering drawings to file and keep up-to-date, its engineering department has its hands full.

One problem that continually confronted them before adopting micro-



Prints as large as the screen size—18" x 24"—are made by merely inserting the aperture card in this Filmac 200 and pressing a button. Finished print is ready for shop use in about 10 seconds.

film was the wear and tear on drawings. Copies of original tracings were used by the production control group and by personnel in the plant area. In the preparation of the copies, the original tracings wore out quickly, just from handling and from removing and replacing the original tracings from storage. From time to time, new tracings had to be re-drawn. In view of the large numbers of drawings handled, keeping them in good condition and up-to-date was expensive.

All engineering drawings are now microfilmed and put on "Filmsort" aperture cards—electric accounting machine cards containing individual frames of microfilm. Two cards are

made of each drawing, one is the master that is sent to a maximum security area off the premises and the other is a working copy for use in the engineering department.

Heart of the printout is a "Filmac 200" microfilm reader-printer which makes either full-sized copies—18" by 24"—or half-sized blowups in about ten seconds.

Standard Electrical Tool reports that the unit permits prints to be made at any time of the day or night. Its former, more complex printing facilities did not permit such rapid service because preparation and clean-up time were extensive.

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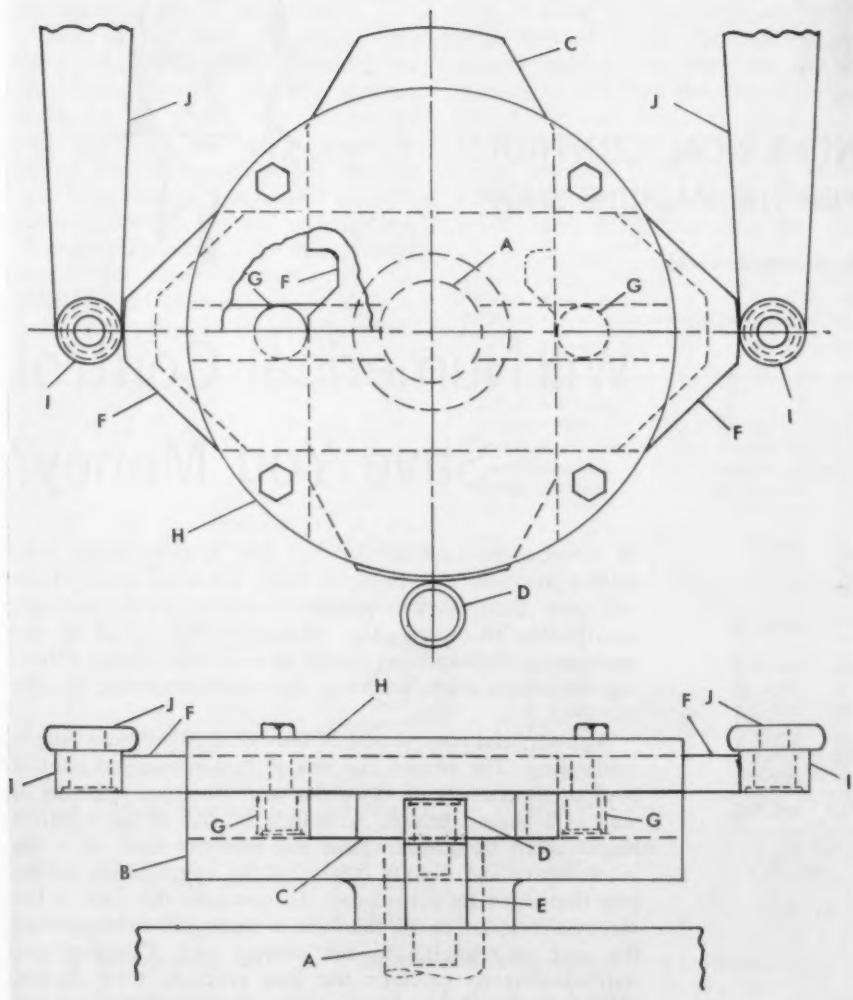
By L. Kasper

Variable - Rise Cam Operates Two Levers

■ Two oscillating levers were required, on a wire forming machine, to operate at the same time with each half-revolution of an operating shaft, and with alternate movements of the levers to be of different magnitudes. The plan view and front view of the mechanism show how this was accomplished.

The driving shaft **A**, which may operate in either direction, carries the cam body **B**, which is grooved to carry the cam plate **C**; it is a sliding fit. Plate **H**, is grooved to carry two cam plates **F**, which slide freely. Parts **F** each carry a roller **G**, which are in contact with plate **C**. The outer, contoured ends of plates **F** are in contact with the rollers **I** carried on levers **J**. Springs, not shown, on the operated mechanism, serve to maintain contact of the rollers. Stud **E**, mounted on a stationary part of the machine, carries the roller **D** which contacts the end of plate **C**.

The assembly is shown with the rollers **I** in contact with the cam plates at the midpoint of the rest period at high point of the movement. The contact of cam plate **C** with roller **D** has moved plate **C** to the rear, so that the rollers **G** are resting on the straight parallel sides of plate **C**, as shown in the broken out section. As the cam assembly rotates, the rollers **I** will ride off the projecting ends of plates **F** onto the periphery of plate **H**, which provides the rest period at the low point of the movement. Continued rotation of the cam assembly will bring the opposite end of plate **C** into contact with roller **D**, so that plate **C** is again moved to the rear, which brings the depressions on the sides of plate **C** in a position which permits entry of the rollers **G**. At this point, the outer cam surfaces of plates **F** are in the position shown by



the dotted outline. In this manner, levers **F** are given one long and one short swing for each revolution of the driving shaft.

• • •



NUMERICAL CONTROL FOR THE MACHINE SHOP

By James J. Childs



Will Numerical Control Save You Money?

■ Lone acceptance of the fact that a numerically controlled machine can produce more accurate work at far less cost than its conventional counterpart is normally insufficient to justify the relatively high price of the equipment. Documented results of economic studies affecting numerous manufacturing and allied areas are usually required.

A superficial comparison of the initial investment only is misleading. The reason for this is that numerical control equipment consists of electronic and electrical controls as well as a basic machine. Although the cost of the controls might often be greater than the machine tool, it is the productivity and quality output of the combination of the two that must be considered. To compare the cost of the electronic system to the machine is analogous to comparing the cost of machine to the cutting tool. Compare the requirements to produce the end product, then decide.

The predicted rate-of-expansion for metalworking production for the past half-decade, unfortunately, has not been realized. Management is, therefore, looking more strongly than ever for new cost reduction techniques. The analysis set forth in this article compares a present machining method with a proposed numerical control operation. The analysis is similar to a method presently being

utilized to aid government agencies in the allocation of funds for the procurement of machine tools.

Since direct labor is usually the largest contributing cost factor, the manhours required by the present operation for a one year period are first compared to the manhours required for the same period by the new equipment. Thus, if one numerically-controlled profile milling machine could produce the same quantity output as three conventional machines*, the manhours required, considering a two-shift operation, would

be reduced from approximately 11,520 hours per year to 3,840 hours per year (Fig. 1, Line A). Assuming an hourly wage rate of \$2.50, the cost of the present method for the year would amount to \$28,800, the cost with the numerical control equipment \$9,600 (Line B). If indirect costs and fringe benefits (Line C) amount to \$2.00 per hour, the present operation would cost \$23,040 during the one

*Due to an uninterrupted cutting cycle, savings of 65% to 95% in floor-to-floor machining time utilizing numerical control equipment is not uncommon and has been documented consistently.

Line		Cost of one year operation with present equipment. (3 conventional milling machines)	Cost of first year operation with one numerical control machine
A	Direct manhours (8 hrs. per day X 2 shifts per day X 240 days per year X 3 machines)	11,520	3,840
B	Direct Labor Costs (\$2.50 per hour X 11,520 hrs.)	\$28,800	\$ 9,600
C	Indirect Labor Costs & Fringe Benefits	\$23,040	\$ 7,680
D	Maintenance	\$ 1,000	\$ 500
E	Scrap & Rework	\$ 3,000	\$ 300
F	Tooling	\$20,000	\$ 8,000
G	Inspection	\$10,000	\$ 1,000
H	Tooling Storage and Preservation	\$ 1,000	
I	Total Operating Cost For Year	\$86,840	\$27,080
Operating Savings = \$86,840 — \$27,080 = \$59,760			
Cost of new machine = \$100,000			
Installation		= \$ 10,000	
Total Installed Cost		= \$110,000	Required Investment = \$ 80,000
Disposal value of Present Equipment		= \$ 30,000	First year depreciation from (17.6% X 80,000 from Fig. 2) = \$ 14,080
Overall First Year Savings = \$59,760 — \$14,080 = \$45,680			

1. The calculations shown above describe one economic approach for justifying the purchase of machine tools.

NUMERICAL CONTROL continued

year period and the cost for the numerically controlled machine would be \$7,680.

Maintenance cost (Line D) for the numerical control machine has been estimated to be one-half that of the present machines.

The minimal operator control during the cutting cycle and the repeatability of numerical control have virtually eliminated scrap during production runs. However, checkout of tapes and holding fixtures may result in some scrap and a \$300 figure has been chosen (Line E).

With tape preparation replacing template fabrication, expected costs in this area are anticipated to drop from \$20,000 to \$8,000 (Line F).

While not as apparent as direct machine hour savings, inspection costs on parts machined by numerical control are reduced substantially due to exceptionally close repeatability and al-

most infallible cutting cycles. The probability of the machine not cutting according to the tape's instructions is remote and, therefore, statistical quality control techniques may be employed more extensively (Line G).

Tooling storage, inspection and very often preservation are virtually eliminated since a considerable quantity of tape can be stored in a file cabinet drawer (Line H).

The total estimated operating cost for the year amounts to \$86,840, if no action is taken; and \$26,880, if the numerically controlled machine is purchased (Line I).

The operating savings of \$59,960 must be compared with the first year depreciation cost of the new machine. The first year depreciation cost is an amortized portion of the total investment depending on the expected service life of the new machine. In our example we have chosen twelve years. To remain conservative, the first year depreciation cost for the total investment is 17.6%, Fig. 2, of \$80,000 or \$14,080 and not one-twelfth of the \$80,000 as might be expected. The percentage depreciation for succeeding years will be progressively less. Since succeeding years will result in greater savings than the first year, it is not necessary to calculate beyond the first year.

Referring to our example, Fig. 1, the first year depreciation cost of \$14,080 is compared to the operating savings of \$59,760. It is apparent that the numerical control machine can be well justified since an over-all net savings of \$45,680 for the first year would result by its purchase.

• • •

Service Life (years)	% FACTOR (To be multiplied by the dollar investment)	
	%	
5	35.6	
6	30.9	
7	27.3	
8	24.5	
9	22.3	
10	20.4	
11	18.9	
12	17.6	
13	16.5	
14	15.5	
15	14.7	

2. In order to calculate the first year's depreciation cost for a new machine, the total investment is multiplied by the per cent (%) corresponding to the expected service life.

**B
B**

LUBRICANTS AND COOLANTS

by **Allen F. Brewer**

Lubrication

and the Machine Tool

■ Machine tool lubrication occupies a unique status in metalworking—it not only affects the operating parts of the machine but also the performance of the cutting tool which shapes the product. Ever since Tubal Cain, the first iron worker, man has progressively improved the art of fashioning metals. Invention of the blast furnace around 1750, followed by the Bessemer process some hundred years later, marked the beginning of the age of steel. The machine age already had begun; mass production was soon to follow—as soon as the petroleum industry produced lubricating oils and greases to supplant the time-honored tallow pot.

The concept of metal shaping by cutting instead of abrasion dates back to the late 18th and early 19th centuries. Until the lathe was invented, hand shaping only was possible. Maudsley's lathe in 1789, Eli Whitney's milling machine in 1798, and the planer of Clement in 1820 laid the groundwork for the machine tools as we know them today. These men demonstrated that precision finishing was a practical possibility.

The Importance of Machining

Machining of metals probably is the most important process in the building of modern industrial machinery. No part regardless of size, which has to operate in se-

quence with other parts, can finally be assembled before it is cut, drilled, milled, planed, or ground. Which process is used depends upon the purpose for which the part is intended. According to the degree of surface finish desired, the accuracy or the shape of the final piece, the work must be put through a lathe, milling machine, boring mill, drill press, broaching machine, planer, shaper, slotter or one of many types of grinding machines.

In the beginning, the machining processes were not too intricate. The soft metals of those days did not require high speeds to develop satisfactory surface finishes. The laboratories changed all this when they brought harder steels and bronzes into the picture, which were more resistant to

wear and possessed of high tensile strength and ductility. Such metals, or should we say alloys, today are capable of withstanding the prevailing heavy loads, the effects of impact, and wear when in contact with companion steels or other alloys.

Lubrication of operating mechanisms is highly important. To insure that lubrication is dependable, automatic means of applying oils or greases under pressure have been perfected. Careful attention must be given to the selection of lubricants suited to these systems and to the operating conditions which prevail. Dependable operation is the primary requisite in tool operation just as accuracy of control is necessary for precision cutting and finishing of metals. This is assured when the mechanisms are designed and sealed to prevent oil leakage and entry of abrasive non-lubricating foreign matter. Construction of this nature encourages the use of the highest quality lubricants because waste is virtually negligible.

Lubricating oils and greases which are prepared to be as resistant as possible to oxidation and breakdown can be relied on when exposed during service to oxidizing conditions induced by elevated temperatures. Lubricants of this type also are best adapted to the modern systems of positive and continuous lubrication such as centralized pressure for greases and pressure circulation where oils are concerned. Both exert a cleansing action that flushes the contact surfaces of dust, dirt or minute metallic particles which may have gained entry. • • •





How to Fasten Carbide to Steel

Part 4: Shrink Fit Mounting

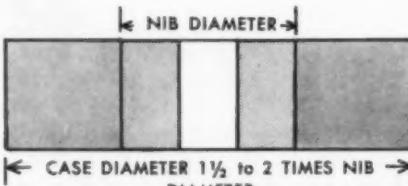
By **Grant A. Morrison**
Manager, Applications Engineering
Metallurgical Products Department
General Electric Company

■ Cemented carbide sections may be held by a shrink fit assembly when compressive support is required for the carbide. A shrink fit assembly is obtained by heating the case, causing it to expand to permit insertion of the carbide in the case. Upon cooling, the case shrinks around the carbide, supplying the desired support. The holding power is provided by an interference between the O.D. of the carbide insert and the I.D. of the steel case which holds it. Die rings are often mounted in this manner.

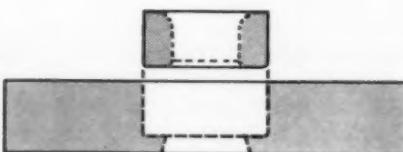
Materials other than steel may be used to hold carbide in a shrink fit, but because these materials have lower strengths they will not support it with a strong compressive load.

The shrink fit assembly is limited where the assembly must be heated above the draw temperature of the case to obtain the proper amount of interference or compressive load, and where the steel case will not expand enough at the shrink temperature to allow the required clearance between the nib and the case to insert the carbide nib in the assembly.

continued



1. Ratio between the case and insert diameters.



2. Radius in corner of recess reduces stress concentration. Chamfer on corner of nib should be larger than radius.

Design of Shrink Fit Assemblies

The compressive support derived from a shrink fit is a function of several variables, including:

The amount of interference. For adequate support, the interference between the O.D. of the nib and the I.D. of the case should normally be at least .002" for each inch of carbide diameter.

The wall ratio of the insert. The ratio of the insert O.D. to the insert I.D. will vary from about 3:1 for small die rings to about 1.2:1 for larger inserts.

The ratio between the case and insert diameters, or case wall ratio. The diameter of the steel casing should be approximately 1½ times that of the carbide; and for heavy draws, twice the nib diameter, Fig. 1.

The grade of carbide used in the assembly. Grades with high Young's Modulus of Elasticity, such as Carboloy's grade 883, are more resistant to effects of shrink pressure and therefore require more interference to achieve the same shrink pressure at the I.D. of the nib than lower YM grades, such as grade 55B.

Severe applications, such as nosing, ironing, extrusion, and heading, re-

TABLE I
NORMAL SHRINK FIT ALLOWANCE

NIB RANGE—O.D.		SHRINK ALLOWANCE
FROM	UNDER	
.437	.562	.0013-.0018
.562	.687	.0016-.0021
.687	.812	.0021-.0026
.812	.937	.0025-.0030
.937	1.125	.0028-.0033
1.125	1.375	.0035-.0045
1.375	1.750	.0038-.0048
1.750	2.000	.0043-.0053
2.000	2.500	.0045-.0055
2.500	3.000	.0050-.0060
3.000	3.500	.0055-.0065
3.500	4.000	.007 -.008
4.000	5.000	.009 -.010
5.000	6.000	.011 -.012
6.000	7.000	.013 -.014

This table applies to shrink assemblies using a hardened steel case. Some exceptions where the table would not apply are: Where case hardness exceeds 50Rc (a lower shrink may be required because the case cannot be heated to normal shrink temperature without drawing the steel); in assemblies with extremes in the ratio and proportion of case and insert walls. (In such cases a lower shrink may be indicated); where severity of the operation demands maximum pre loading of the carbide (here an increase in the amount of interference would be required); with a soft steel case, due to the low yield point of unhardened steel; and, when shrinking a carbide ring over a steel core.

TABLE II
COEFFICIENT OF LINEAR THERMAL EXPANSION
FOR TYPICAL CARBOLOY GRADES

Grade	from 70°F to:			
		400°F	750°F	1100°F
55B		3.24	3.31	3.45
55A		2.98	3.08	3.30
44A		2.38	2.66	2.80
608 Chrome Carbide	5.08	5.49	5.95	
Steel: AISI 6145	6.5	6.9	7.8	
Stainless Steel: 302	9.2	9.6	10.2	

quire more compressive support for the die insert than do light draw operations. This added support is provided by an increase in the amount of interference. Operating pressures and stresses in the carbide and steel can be readily calculated, and it is recommended that this be done when there is doubt concerning adequate nib support. For most applications, however, Table I can be used as a guide in selecting the proper amount of interference.

A limiting factor in shrinking an insert is the draw temperature of the heat-treated case, which must not be exceeded when heating for assembly. Generally, if the interference is greater than .004" per inch of nib O.D., press assembly rather than shrinking will be required.

Compensating for Loss of Interference at Operating Temperatures

The effect of the relatively low coefficient of expansion of carbide must be taken into consideration where heat is involved. The support lost due to thermal expansion must be calculated and the interference increased by that amount.

To determine the loss of support,

compute the expansion of the case and the expansion of the carbide at the operating temperature, Table II, using the following formula:

Expansion = O.D. of the carbide x coefficient of expansion x increase in temperature in degrees F.

Steel Case Specifications and Heat Treatment

For shrink assemblies, a steel such as AISI 6145 or AISI 4140 is suggested. A satisfactory hardness is 38 to 42 Rc. This hardness will develop a yield strength of approximately 150,000 psi, which is adequate for most applications. Lower or higher hardness values may be specified for the steel case, depending on the specific application. A soft case will not provide adequate support because of the low yield point of unhardened steel.

The heat treatment specification for AISI 6145 is as follows:

1. Heat to 1500° to 1600°F.
2. Hold thirty minutes.
3. Quench in oil to 300°F.
4. Draw immediately two hours at 900° to 950°F to get 38-42 Rc.

continued

Preparation for Assembly of Shrink Fit

Machining the steel recess is less expensive than grinding the carbide O.D. Therefore, grind the O.D. of the nib first. The recess is then machined to fit the nib with the recommended interference, and finished to thirty-two micro inch finish or better. Surface finish on the I.D. of the recess is important to assure adequate support. A coarse finish in the recess has the effect of reducing the amount of shrink pressure.

In die applications the bottom of the recess must be square with the center line of the case so the nib will be fully seated when assembled. A radius in the corner of the recess and

a chamfer on the corner of the nib are required to reduce stress concentration, Fig. 2.

How to Assemble for Shrink Fit

To assemble a shrink fit, heat the case to a temperature lower than that at which the steel was drawn. A steel drawn at 900°F, for example, may be heated to 875°F with safety. With the case at shrink temperature and the insert at room temperature, the fit must allow a minimum clearance of .002" to .004" to permit easy assembly.

After the carbide is dropped into place, it should be pressed to assure bottoming in the case. After cooling the assembly should be finish machined.

• • •

Modern Machine Tools Assure Sustained Output

■ Only when men are given the use of modern machine tools can there be any assurance of a sustained increase in output. Although the volume of production itself can be increased by employing more workers or by working those employed more hours, an increase in productivity is only achieved by increasing the output per hour of the individual worker.

This can be done in some instances if he is willing to work harder, but the machine tool builder accomplishes it by making the work easier—by simpler and more convenient controls

—by using more automatic methods.

In every way possible, machine tool builders have been adopting means of automatic operation which relieve the operator of actual physical work while increasing his output per hour.

Probably the greatest single contribution to increased output has been the continuing development and application to machine tools of electrical and electronic controls and drives. They have made it possible to build into all machine tools new levels of precision, performance, and production.

• • •

B
B

CUTTING TOOLS



By **Lloyd Stoner**
Vascoloy-Ramet Corp.
Waukegan, Illinois

Between Carbide and Ceramic

■ Titanium carbide cutting tools have been on production jobs long enough so that we can evaluate the advantages of this new material. At first there were skeptics who discounted early reports as overly optimistic or just downright exaggeration. No doubt the skeptics were right in some cases, but let's see if we can put the details back into focus.

A strong point of titanium carbide is its versatility, its ability to operate at a wide variety of surface feeds and its ability to machine a wide variety of materials.

By titanium carbide, we mean the class of materials that contain no tungsten carbide or cobalt. These new grades have titanium carbide as the main ingredient. The new cemented titanium carbide is fabricated by powder metallurgy in the same manner as conventional carbides—we call it V-R65.

A favorite application that demonstrates the many capabilities of titanium carbide is finish turning the front axle ball for a four-wheel drive vehicle, Fig. 1. The ball is a steel forging with a Brinell hardness ranging from

**Titanium carbide can operate over a wide range
of surface speeds of a wide variety of materials**

230 to 270. The O.D. of the ball ranges from $10\frac{1}{4}$ " to $5\frac{1}{2}$ " and when it is turned at 333 rpm the tool must cut its speeds from 840 sfm on the maximum diameter down to 450 sfm on the smaller diameter. The $\frac{1}{8}$ " thick insert cuts at a depth of .002" and a feed of .005". Even though this is a severely interrupted cut, the finish resulting averages 50 rms. Titanium carbide tool life is three times that of conventional cemented tungsten carbides and the machining time is reduced by one-half. Whether or not the titanium carbide would perform without breaking with a larger feed or depth-of-cut is speculation.

Variation in surface speed is inherent of facing operations. Time and again, titanium carbide's performance on many facing operations can only be described as outstanding. One example is a square mounting bracket for a 3" pipe end. The bracket has drilled holes in each corner and is made of 1045 steel. The job is being done with titanium carbide at from 980 sfm down with a feed of .005" and a depth of cut of .060" for roughing and .020" for finishing.

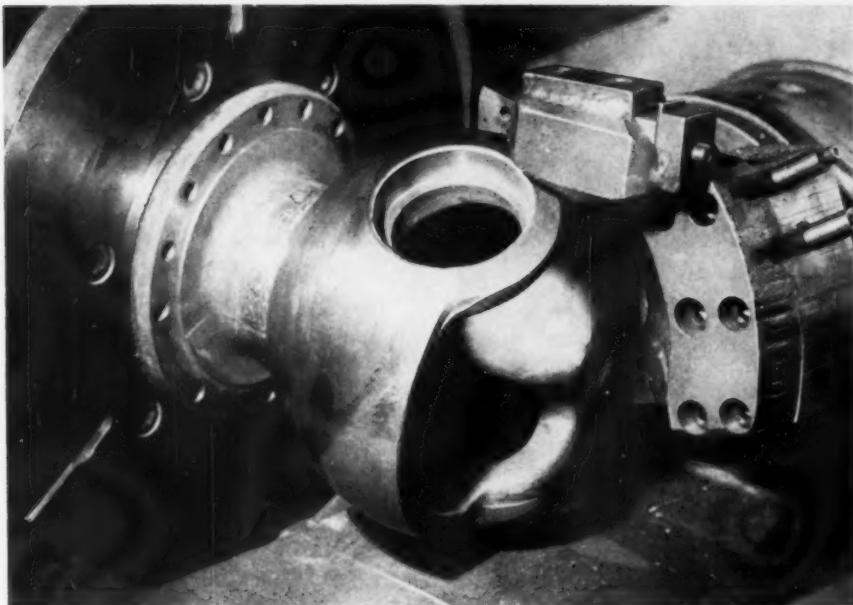
Another example is facing a crank-shaft flange made of 300 Brinell 1046 steel. The flange has six equally spaced tapped holes and the cut is made at surface speeds that vary from 200 sfm to 600 sfm. Titanium carbide machines 60 pieces per corner. Cemented tungsten carbide grades

were getting approximately 40 pieces per corner. To obtain this tool life with titanium carbide, honing a .005" to .008" radius on the cutting edge was necessary. The rigid setup being used also contributes substantially to the success of this operation.

A facing operation is being done on a 90 mm. shell casing made of 1030 drawn steel with a hardness of 36 Rc. Surface speeds run from 620 on the O.D. to 0 at the center. When titanium carbide was introduced to the same machine setup used previously with tungsten carbide grades, it yielded 720 pieces per index whereas the C-7 carbide used before would produce 150 pieces per index.

The point we are driving at is that when a material can be machined efficiently by titanium carbide, titanium carbide will machine it at a wide range of speeds usually with a longer tool life than tungsten carbide grades. This enables the engineer or production foreman to introduce titanium carbide to a setup current in his shop and evaluate its performance without interrupting other work. When this is the case, tool life may be increased up to 15 times.

If the user should so choose, he may increase the speed of machining to double production and settle for tool life that may be only four times what he was previously getting. Another case:- A bushing is being machined out of seamless steel tubing. The pre-



1. Finish turning a front axle ball for a four-wheel drive vehicle with titanium carbide. This operation has all the elements for poor tool performance: A variation in surface speed, interrupted cutting, close finish and contour tolerances. In this instance, titanium carbide tool life is three times that of conventional carbides and finish and size tolerances are better than required while machining time is reduced by one-half.

vious practice had been to turn the O.D. at 350 sfm with a $3/16$ " depth of cut and .005 feed. The tungsten carbide grade would machine 15 pieces per index. With the titanium carbide they are running at 500 sfm with the same feed and depth-of-cut previously used and getting 30 to 35 pieces per index.

Corollary to longer tool life and higher speeds is better size control and finer surface finish. Titanium carbide cutting tools have given outstanding performance on mild steel and cast steel. Monel and 300 series stainless steel have been and are being machined successfully with titanium car-

bide. It has been used successfully on cast iron and gives outstanding performance when the cast iron has higher percentages of steel.

Originally, titanium carbide was assumed to be exclusively a high speed finishing tool material. High speed finishing is, no doubt, its strong point but the previous examples cited leave no doubt concerning its ability to take an interruption.

Our conclusion is that titanium carbide tool materials now offer a versatility in speed and application that make it a valuable addition to a wide variety of tool materials on the market.

• • •

B B

Shop Hints

DIAMOND TURNING TOOLS SPEED ARMATURE REFINISHING

By Alex S. Arnott

■ When refinishing armature surfaces, we found that a diamond-tipped tool produces a smooth surface in one operation. Formerly, we had to make a rough cut, finish cut, lap, polish or buff, and then remove burrs. Because the diamond tool removes less material, the life of the armature is also extended.

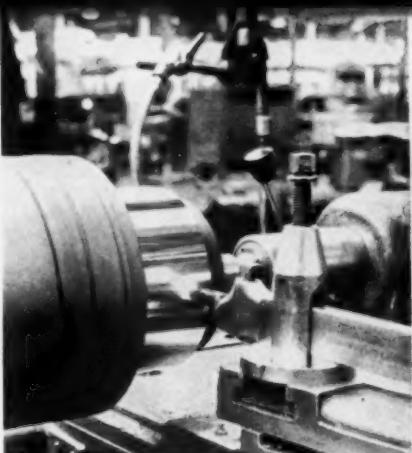
The armature being turned down in the illustrations is for a railroad traction motor. It is 8" in diameter with a commutator face $3\frac{1}{2}$ " wide. The armature is mounted on its shaft center at the tailstock and mounted on its shaft bearings at the chuck end. A feed of .004" is used at 400 rpm; depth of cut is .005" for this par-



ticular job. Incidentally, highly accurate lathe spindles are very important in diamond tool cutting technique to maintain concentricity. No lubrication is necessary; however, clean metal surfaces result in a better finish.

Diamond tools are particularly suited for machining soft materials, such as copper, hard fiber, hard rubber, aluminum, and zinc. Light cutting pressure makes diamond tools ideal for turning or boring thin tubing.

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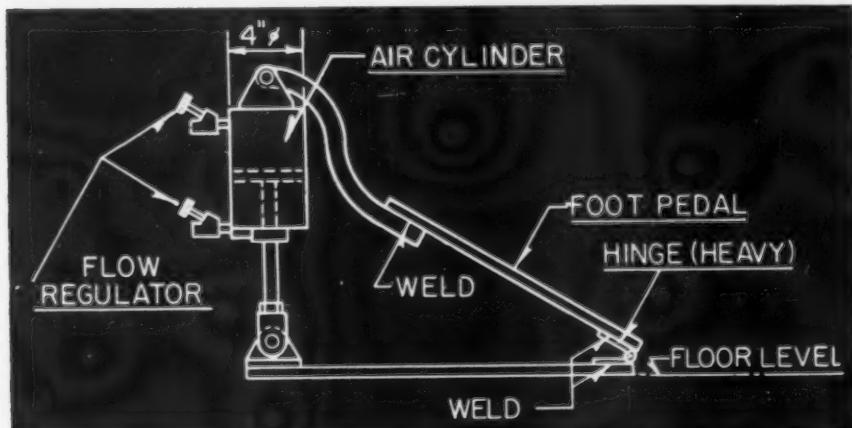
AIR CYLINDER SMOOTHS OPERATION OF FOOT CONTROL

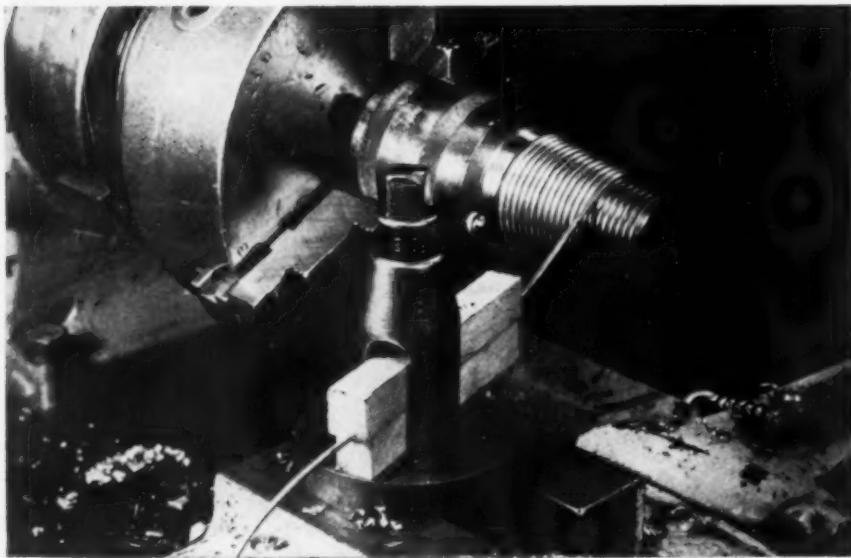
By John M. Breen

■ Smooth starting for foot-actuated pneumatic cylinders was obtained in our shop by incorporating a standard double-acting air cylinder and two flow regulators into a machine's control system. The change was necessary because fast and abrupt starts for a special job was spoiling the work. Because both hands were needed to hold the work, foot actuation was used.

The two flow regulators are of the needle valve type that restrict the flow of air in one direction only. Restricting the air flow results in a slow depression rate and a slow rate of return of the foot pedal. In order to easily regulate the air flow, we installed knurled adjustment screws in place of the slotted adjustment screws, eliminating the necessity of a screw driver.

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TAPERED SPRING WOUND ON THREADED MANDREL

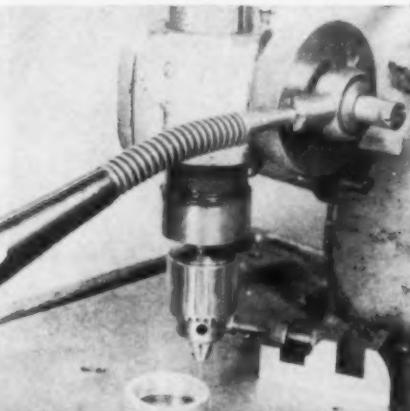
By H. J. Gerber

■ A small quantity of tapered compression springs can be wound on an engine lathe by means of the illustrated set-up. A threaded tapered mandrel was gripped in a chuck and the spring wire fed through hardwood friction blocks clamped in the lathe tool post. The end of the wire has

been secured to a cap screw on the shoulder of the mandrel. This short, looped end is later cut off the completed spring.

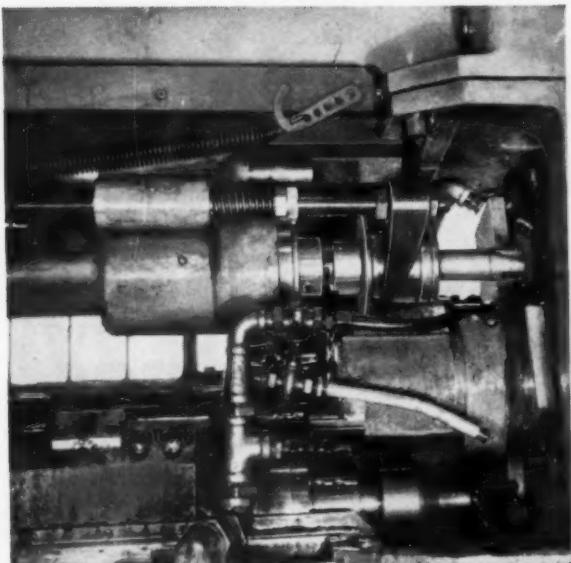
The lathe carriage may, on a job of this kind, be fed either by hand or through the leadscrew. I found it very easy to follow the winding by handwheel feed. • • •

SPRING INCREASES SENSITIVITY OF DRILL FEED



By H. J. Gerber

■ The sensitivity of the feed on a small drill press can be increased considerably by incorporating a standard compression die spring between the feed lever and its handle. We have found this stiff spring will yield just enough to prevent over-feeding—thereby reducing breakage of extremely small drills. • • •



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• • • • •

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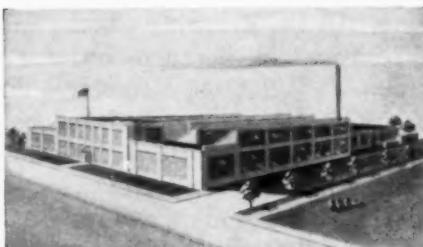
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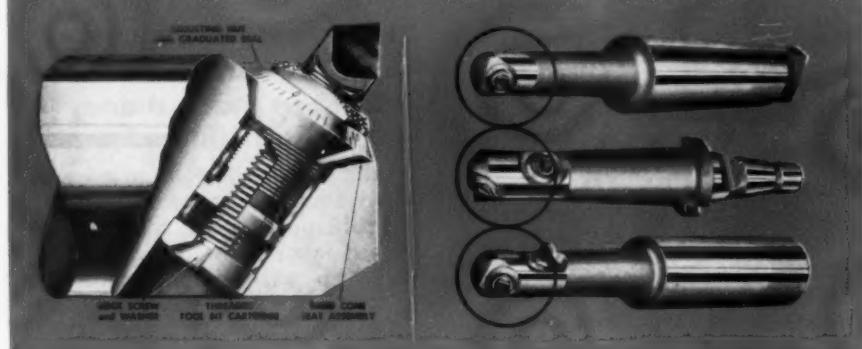


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Patented micrometer vernier adjustment! That's the exclusive feature that makes DeVlieg MICROBORE cutting tools so fast and easy to set. It's the built-in feature that eliminates trial and error cuts; reduces machine downtime and rejects. Micrometer vernier adjustment is also the feature that makes it easy to achieve accuracies impossible or extremely difficult to arrive at with conventional tooling. But that's only part of the story! Write for complete information on MICROBORE. Introduce yourself to a system of multipurpose tooling designed to deliver the utmost in precision and production from today's high performance machine tools.

DEVLIEG MICROBORE • DIVISION OF DEVLIEG MACHINE COMPANY • FAIR STREET • ROYAL OAK, MICHIGAN

MICROBORE • PRECISION TOOLING CENTER

DEVLIEG
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SYSTEM

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October, 1961

149

How to save money and make money with modern metallizing

With today's improved metallizing materials and methods:

PLANT EXECUTIVES find new ways to slash maintenance costs, reduce downtime, cut machine parts inventory...

JOB SHOP OPERATORS find new ways to build highly profitable business doing parts-salvage and maintenance work for plants in their area.

JOB SHOPS

make good money with metallizing because they save good money for local firms.

METCO has prepared a special bulletin detailing actual operations and costs of typical flame spraying work on shafts, templates, bearings, many other surfaces. Use coupon to get your free copy.

NEW! Business-building kit for job shops, to help METCO equipment owners build new business, pay off investment in minimum time, and use flame spraying to increase other machining and welding business. Contains samples of direct mail letters, post cards, envelope stuffers, photos, advertising mats. These promotion materials are available in lots of 100 at our cost, well below what you'd have to pay to print your own. One copy of kit available free — send for it today. (See coupon.)

These real-life examples show how plants save money, job shops make money with metallizing

Necks of winding rolls in a textile mill were formerly repaired by a slow machining method, requiring highly skilled labor. Now the worn necks are built up with flame sprayed metal, quickly machined to size. Savings run \$20,000 a year.

A job shop in California specializes in flame spraying oil well pump plungers, gets all the business it can handle in spite of the fact that the plungers it hard-faces last eight times as long as new ones. The largest ones cost only \$45.00 to rebuild, against \$110 to replace. Volume on just this one profitable metallizing service: \$35,000 a year.

Valve plugs and seats, working in sand, oil and salt water, lasted only a few hours in service. Hard-faced by welding, a set cost \$155, lasted from 3 to 8 hours. When flame sprayed with tungsten carbide powder, service life was increased to a minimum of 2 weeks, 4100% longer! Cost of metallized set, \$73. But reduced downtime far outweighs the dollar savings.

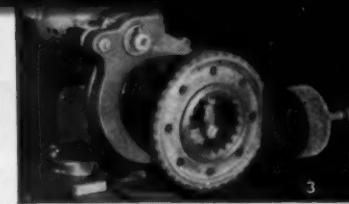
A Connecticut job shop makes a very good profit when it flame sprays small



1



2



3

Any good mechanic can quickly master the three basic steps of metallizing: 1. prepare the surface; 2. flame spray; 3. finish.

shafts for \$27.50. The customer is happy, too—he formerly had to pay over \$50 to have shafts built up with welding.

The same job shop salvaged a big degreasing tank, value \$2,850, by flame spraying with zinc for \$683. The shop made money, the customer saved money.

A shipbuilding company installed metallizing equipment to repair such parts as pump rods, pistons, crank shafts for diesel engines, stern bushings, valve stems. A badly worn tugboat shaft, replacement cost \$3,000, was repaired and made better than new for \$400. That job alone more than paid for the METCO equipment.

From these cases you can see how modern metallizing pays, whether in plant maintenance departments or in job shops serving the many companies that

don't need their own installation. Whenever there's wear, in rotary or sliding action, there's an opportunity to save money and make money.

New and improved materials

Among these new materials are a number of nickel, chrome, boron hard facing powders. Sprayed tungsten carbides are also widely used. Many others are available to give new values to the basic benefits of metallizing, which may be summarized as: less downtime; far less machining or grinding time, reduced parts inventory; and "better than new" performance of the metallized parts.

With savings like these there is plenty of leeway for good job shop profits and big savings for manufacturing plants. To learn more about these opportunities, check the coupon and send it off today.



METCO INC.
FORMERLY METALLIZING ENGINEERING CO., INC.
Flame Spray Equipment and Supplies

1115 Prospect Avenue, Westbury, L. I.
New York Telephone: Edgewood 4-1300
Cable: METCO. In Great Britain: METCO, Ltd., Chobham-near-Woking, England

METCO, INC., 1115 Prospect Avenue, Westbury, L. I., New York

JOB SHOPS ONLY

How
JOB SHOPS
make money
with
Metallizing

- Send Bulletin 14, "How Job Shops Make Money With Metallizing"
- Send Business-Building Kit
- Have Field Engineer Call

How to
SAVE MONEY
and cut
downtime
with
Metallizing

PLANT MANAGEMENT

- Send copy of Bulletin 15, "How to Save Money and Cut Downtime with Metallizing"
- Have Field Engineer Call

Name _____

Title _____

Company _____

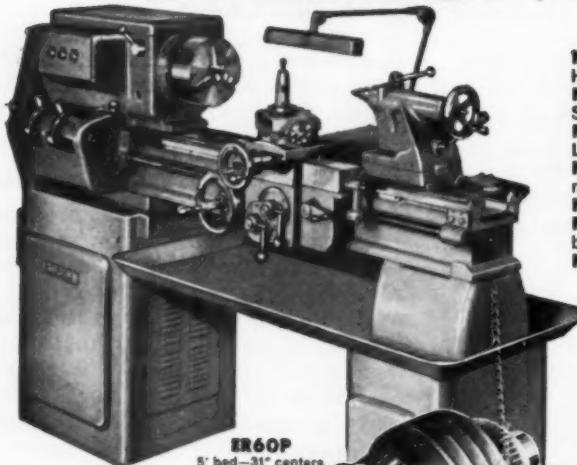
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Both NEW and DIFFERENT SHELDON 15" PRECISION LATHES



Send in coupon →
for full information.

This is an all new lathe that bridges the gap between conventional belt driven and geared head lathes. It combines the capacity and power of a geared head with the economy and flexibility of a belt driven lathe. Available with 5', 6' and 8' bed lengths providing 31", 42" and 66" center distances.

SHELDON MACHINE CO., INC. • 4242 No. Knox Ave. • Chicago 41, U.S.A.

Gentlemen: Please send me information on items checked.

- The NEW and DIFFERENT SHELDON 15" Lathes
- Sheldon 10", 11", 13"
- Lathes
- 11" and 13" Variable Speed Lathes
- High Speed Turret Lathes
- Sebastian 13" and 15" Geared Head Lathes
- Horizontal Milling Machine
- Sheldon 12" Shaper
- Name of Local Dealer
- Have representative call

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Company Name

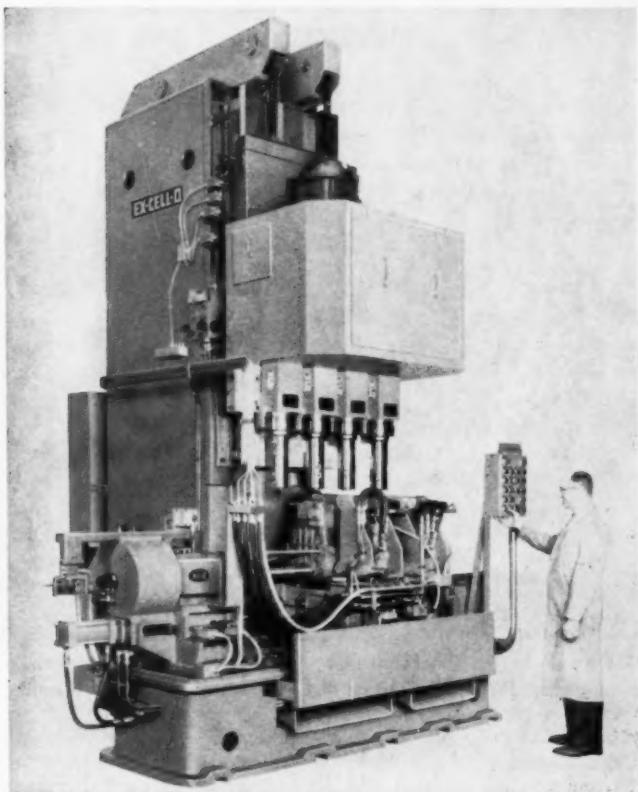
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Company
 Home

City..... Zone..... State.....

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What's New in Metalworking



Boring Machine Faces Crankshaft Thrust Surfaces

A vertical cylinder boring machine, having a horizontal slide for finishing crankshaft thrust faces of engine blocks, has been developed by Ex-Cell-O Corp. Facing operations can

be performed simultaneously with the cylinder boring.

In operation, a block is manually loaded and pushed against positive stops. The elevator lowers, locating

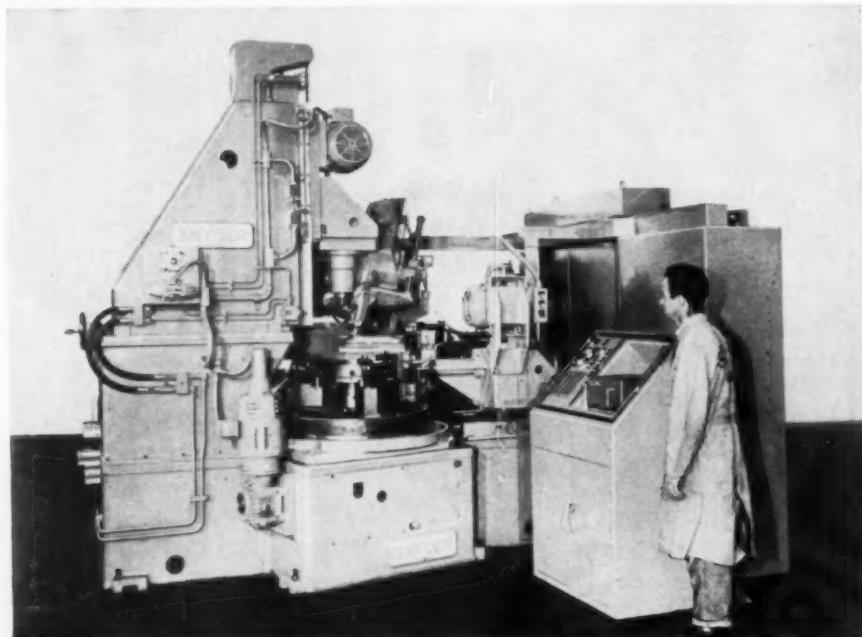
pins enter the part, and it is clamped. The fixture traverses to the left, causing the block to move over the horizontal boring bar and also to be positioned relative to the vertical boring quills.

Cylinder boring commences on alternate holes. As the quills reach the end of their stroke, a chamfering opera-

tion is performed within the cylinder bores by using a hydraulically fed form tool operated from within the quills. When the quills have returned to their starting position, the fixture indexes and the remaining cylinder bores are similarly machined.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

Use postpaid card. Circle No. 80



Numerical Controls on Multiple-Head Machine

A numerically controlled dial-type special machine for drilling, reaming, and counterboring has been developed by Snyder Corp. Controlled by a G. E. Mark I numerical control system, this machine uses punched tape to index the table to proper position and also to initiate automatic feed cycles for the various machining units located around the periphery of the table.

One of the features is the 34" dial index table which indexes at a rate of

2 rpm and maintains spacing accuracy of .0005" on a 32" diameter.

The index table has no shot pins or braking devices. Accuracy of positioning is achieved by a drive arrangement that includes a numerically-controlled amplidyne motor, a double enveloping wormgear reduction, a set of ground and lapped spiral bevel gears, two double enveloping non-reversing worms, and a worm wheel. The wheel is attached to the underside of the index

JARVIS UNVEILS A REVOLUTIONARY DESIGN IN COLD FORMING TAPS! NEW JAR-FLO **LUBE-GRUV® TAPS**

**LUBRICATION GROOVES MAKE
CHIPLESS FORMING OF INTERNAL THREADS
AS EASY AS CONVENTIONAL TAPPING!**



NOW, for the first time, cold forming taps that give *full time lubrication* to the forming contact area during the *full tapping cycle*.

LUBE-GRUV gives you a far superior finish on the formed threads than is possible with conventional cold forming taps.

USE CONVENTIONAL TAPPING EQUIPMENT. The combination of positive lubrication and narrow contact surface makes the forming of internal threads much easier than with ordinary cold forming taps. Jar-Flo with LUBE-GRUV has less drag, requires less driving torque.

LUBE-GRUV Jar-Flo TAPS FOR CHIPLESS
FORMING INTERNAL THREADS IN DUCTILE MATERIALS
STRONGER THREADS — NO CHIPS —
AVAILABLE IN PLUG OR BOTTOMING TYPES

SEND FOR
COMPLETE
DETAILS



CORPORATION

**JARVIS CORPORATION, 102 Washington Park
North Attleboro, Mass.**

Have Rep. call _____ Rush LUBE-GRUV Brochure

Name _____ Title _____

Company _____

Street _____

City & State _____

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table. It is driven by the two close-coupled worms which contact the wheel in locations at 90° to each other to provide an adjustable no-backlash drive.

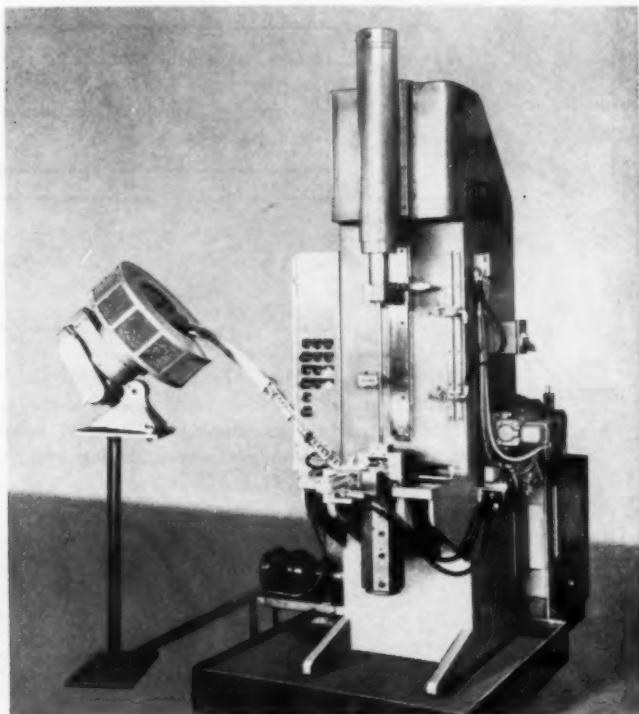
The machining units are standard Snyder way-type units with hardened and ground ways, automatic lubrication, and motorized spindles. The tape initiates the automatic feed cycles for each spindle. Feed rates and amount

of travel are adjustable for each of the hydraulically actuated slides. Separate pushbutton controls are also mounted on the side of each machining unit to facilitate setup operations.

The machine occupies a floor space of approximately 142" by 150".

Snyder Corp., 3400 E. Lafayette, Detroit 7, Mich.

Use postpaid card. Circle No. 81



Broaches Increase Gear Output

A line of broaching machines and tooling for increasing the production of spur gears has been developed by General Broach and Engineering Co. This machine will produce gears at approximately 1000 parts per hour.

Setup for automated, high-production

cycling, 1024 steel gear blanks are loaded, oriented, and conveyed to the broaching fixture along a track from a rotating, gravity-fed hopper. An automatic slide feeds the blanks into broaching position. The parts are then pushed through a pot containing accu-

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Made better to last longer, cut down-time!

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Power Presses

Fabricating Tools

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October, 1961

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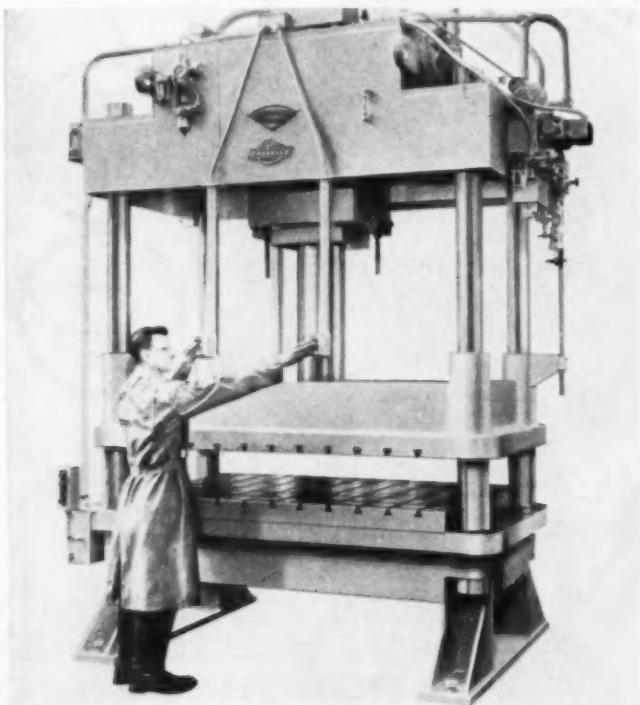
rately ground and located broaching inserts. In one pass, all nine gear teeth are cut, with stock removal amounting to .160" tooth depth. Gravity unloading allows parts to fall directly into a container or a moving conveyor.

Concentricity of the gear bore with

tooth pitch diameter is held to .003" T.I.R. Broaching speed is 50 fpm down and 100 fpm up, utilizing a 24" stroke. The entire machining cycle is hydraulically actuated and solenoid controlled.

General Broach and Engineering Co.,
14333 Prairie Ave., Detroit 38, Mich.

Use postpaid card. Circle No. 82



100-Ton Hydraulic Trim Press

A four-bar trim press, equipped with an adjustable deceleration valve and capable of exerting 100 tons of trimming stroke pressure, is announced by the B & T Machinery Co., a division of Greenlee Bros. & Co.

This machine is designed to overcome the limitations of mechanically operated presses by utilizing hydraulic principles.

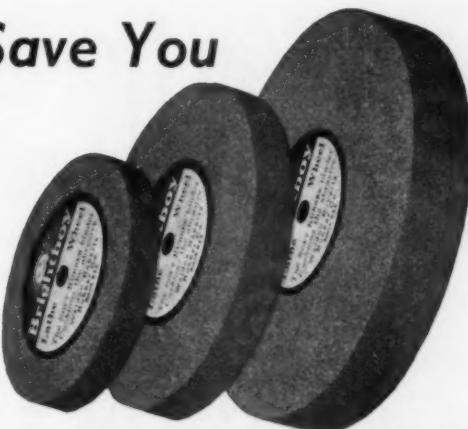
High-speed production results from the fast approach velocity of 900 ipm and a return speed of 875 ipm. The slow trimming action of 59 ipm produces neatly sheared, clean castings.

Other features include a 38" by 72" die area, a supporting 52" by 88" base platen, safety stops on the tie bars, and a 30" stroke.

Greenlee Bros. & Co., Rockford, Ill.
Use postpaid card. Circle No. 83

These Can Save You 50% in Time!

Revolutionary
BRIGHTBOY
RUBBER CUSHIONED
ABRASIVES



Simultaneously BURR • CLEAN • FINISH • POLISH

Work: Metals • Wood • Glass • Fiberglass • Laminated Materials • Some Plastics

The exceptional new achievement in wider uses for abrasives

REPLACES OLDER, COSTLIER METHODS

RUBBER & ABRASIVE COMBINE to produce a unique, time saving, single-operation action so exceptional that it must be seen to be believed. This action frequently serves as the final polish.

JOB-MATCHED, TIME & MONEY SAVING STOCK TEXTURES in wheels, sticks, rods, blocks and points are readily available and specifically suited to your machine and manual production operations.

MULTI-USE Brightboy stock numbers constitute the only complete, comprehensive line of rubber-bonded abrasives. You have extensive choice-range of Silicon Carbide and Aluminum Oxide abrasive grains impregnated in soft, semi-firm, firm and tough rubber binders.

YOU OWE IT TO YOURSELF TO GET REVEALING PERFORMANCE DATA ON MULTI-USE BRIGHTBOY. Write for the BRIGHTBOY CATALOG-MANUAL which details:
Methods & Applications
• Machine Speeds • Job-Matched Stock Numbers
• Wheel Sizes • Complete range.



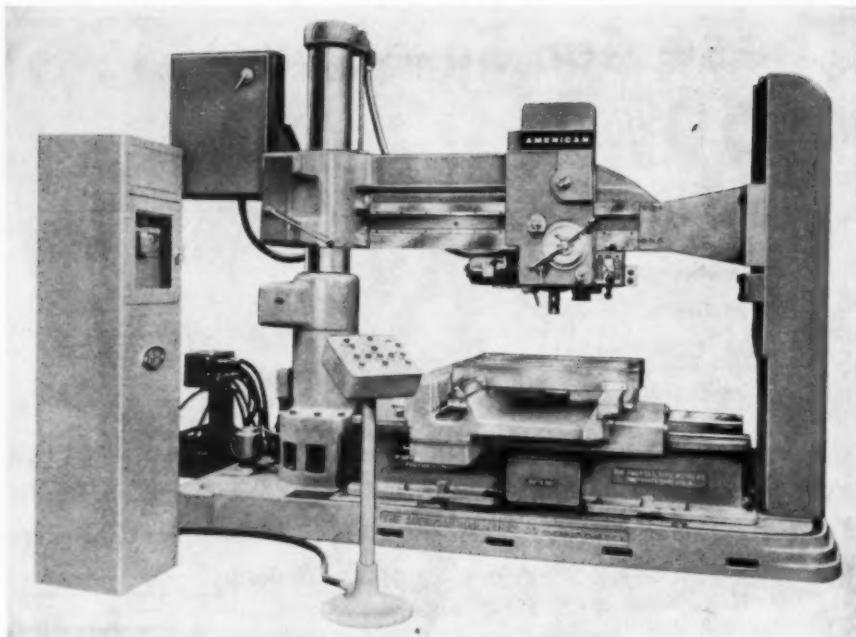
BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.

95 N. 13th Street Newark 7, N.J.
America's Pioneer Manufacturer of Rubber-Bonded Abrasives

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October, 1961

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Tape-Controlled Boring and Drilling Machine

The American Tool Works Co. has announced a package arrangement of an 11" column boring and drilling machine combined with a numerically controlled positioning table. After dials are manually set, controls on the unit automatically traverse the spindle to the workpiece, feed it to a preselected depth, then traverse it back to the starting point. This cycle continues automatically until a tool change becomes necessary.

Spindle travel is 12", while the maximum distance of the spindle to the table top is 37 $\frac{3}{4}$ ". There are twelve power feeds, from .001 to .025 ipm. Twelve spindle speeds are provided, with a choice of three ranges: 30 to 1500 rpm, 45 to 2250 rpm, and 60 to 3000 rpm. The main drive motor is 7 $\frac{1}{2}$ hp.

The table travels 30" on each axis, and has a positioning accuracy of

.00025" with repeatability of .000050". Numerically controlled by punched tape, the table is positioned hydraulically.

The American Tool Works Co., Pearl at Eggleston Ave., Cincinnati 2, Ohio.
Use postpaid card. Circle No. 84

Combined Barrel Finishing And Screen Separating Machine

Power-driven screen separating and high-speed operation are features in Rampe Mfg. Co.'s combine model barrel finishing machine for deburring, micro-finishing, and similar processes. This heavy-duty integrated machine eliminates hand-separating of parts and media.

The machine is available in 4 to 20.7 cu. ft. barrel capacity, with selection of one to four compartments. Speed is variable 10 to 36 rpm, with screen

53-pound grip on 1/32" thin strip...

B&S chuck demonstrates holding power sufficient for 8 hp grinding machine load — by supporting its own weight on 1" x $\frac{1}{32}$ " steel strip.

New Brown & Sharpe Micro-Mesh Chuck

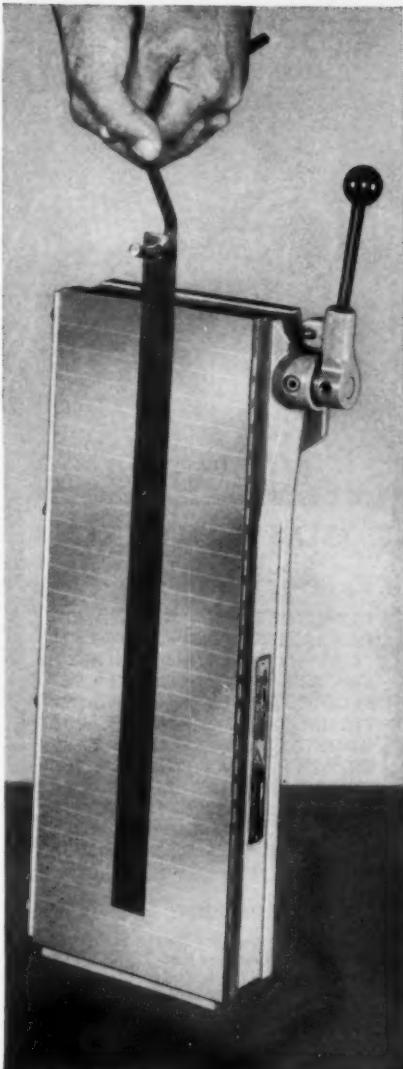
holds parts as thin as .001" for grinding!



Make big savings, grinding or machining small parts. Use the *only* magnetic chuck that grips work as thin as .001", tight enough for production cuts.

Close-spaced, barium-ferrite (ceramic-type) permanent magnets — no dead spots or weak zones — powerful, unbroken field, over the entire working surface.

Ask your B&S distributor for new Micro-Mesh Chucks! Brown & Sharpe Mfg. Co., Prov. 1, R. I.



Brown & Sharpe  PRECISION CENTER

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October, 1961

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The Most For Your "Rockwell Testing" Dollar!



GUARANTEED ACCURATE

CLARK HARDNESS TESTERS ARE GUARANTEED ACCURATE FOR ALL "ROCKWELL TESTING". CLARK'S EXACTING WORKMANSHIP IN THE PRODUCTION OF PENETRATORS, TESTING BLOCKS, ANVILS, AND OTHER ACCESSORIES PAYS OFF IN EXCEPTIONAL ACCURACY ON THE JOB. NO WONDER THE LOW COST SURPRISES OUR FIRST-TIME CUSTOMERS. CLARK INSTRUMENT, INC., 10202 FORD ROAD, DEARBORN, MICHIGAN.

FREE REFERENCE BOOK

Description and prices for Clark Hardness Tester and free Hardness Conversion Chart available on request.



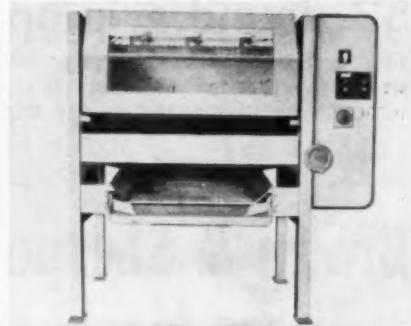
Mobile-Age Accuracy



CLARK INSTRUMENT, INC.
10202 FORD ROAD
DEARBORN, MICHIGAN

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traverse movement adjustable from zero to 1½". The separating screen operates at 350 reciprocations per minute and has removable screens in standard mesh sizes.

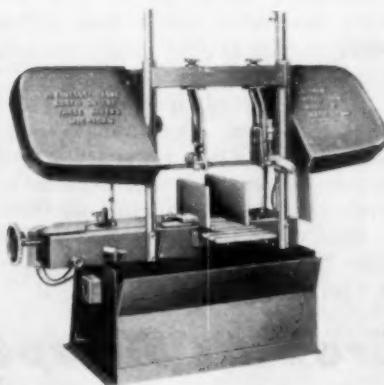
Rampe Mfg. Co., 14915 Woodworth Ave., Cleveland 10, Ohio.

Use postpaid card. Circle No. 85

Variable Speed Drive Added to Band Saws

W. F. Wells & Sons, Inc., has incorporated a heavy-duty variable speed drive on its Models W and F horizontal metal cutting band saws.

The units are infinitely adjustable from 60 to 300 fpm by means of a speed selector dial. Adjustment can be made while the machine is running.



MACHINE and TOOL BLUE BOOK

The drive provides heavier overload capacity than previous models.

Both the W and F machines are operated hydraulically with the cutting head raising automatically to any pre-set height at the completion of a cut. They are also equipped for automatic cycling.

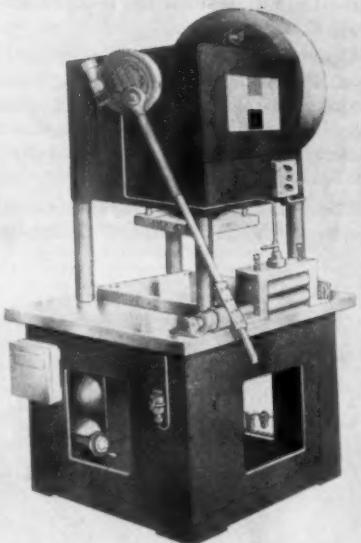
W. F. Wells & Sons, Inc., Three Rivers, Mich.

Use postpaid card. Circle No. 86

25-Ton Automatic Press

Havir Mfg. Co. has announced an all steel 25B, 25-ton automatic press for fast, high-production run blanking, punching, shearing, forming, and piercing operations. It will handle small to medium-weight jobs and is especially good for bulky jobs requiring large die areas. (The actual dimensions are 20" by 12 $\frac{1}{8}$ ".) The press is available in expanded bed model with extra-wide auto feeds.

Of straight side design, this four post construction distributes ram force

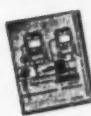


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That's the kind of quick heating action you get with this compact, powerful furnace. It's economical to operate, too. Fast heat-up saves time and gas. High-temperature insulated firebox, 5" by 7 $\frac{3}{4}$ " by 13 $\frac{1}{2}$ " gives even hardening of high speed and carbon steel dies, tools, and small parts. Temperature easily regulated. G.E. motor and Johnson Blower included. 120,000 BTU's per hour.



Pedestal style, F.O.B. Factory \$198.00
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equally for continued production of long runs.

Operating feature is the cylindrical ram. It has maximum guiding surface which insures accurate guiding of ram, punch, and die. The press stops automatically in the event of a die jam or misfeeding.

The standard model tapers up to 8½" stock widths. Air-clamped design pre-

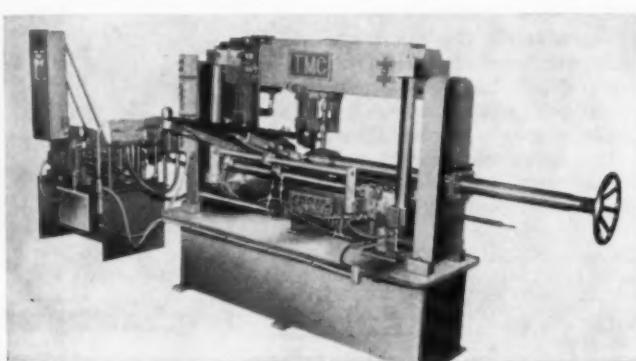
vents stock distortion and allows controllable variations of roller pressure.

The drum-type air clutch assures positive engagement with flywheel through 360° friction surface for greater operating torque at any press speed.

The press has standard operational speeds of 100 to 400 spm.

Havir Mfg. Co., 444 N. Cleveland Ave., St. Paul, Minn.

Use postpaid card. Circle No. 87



Press Roll Forms 700 Steel Conveyor Rolls Per Hour

High-speed, automatic roll forming of steel conveyor rolls up to 2½" diameter, 48" length, is now possible with a heavy-duty hydraulic press available from Trimble Mfg. Co., Inc. It comes in two styles. Model 150-AF requires no operator. It has a special mechanism that automatically feeds cut tubing down a feed chute into the press, where both ends are roll formed at the same time. The roll is then rejected. Model 150 has no automatic feeder.

Both models are driven by a 20 hp

1800 rpm motor unit, which is set up opposite the press in a location suited to individual plant layouts.

Capacities of the two models are 2½" O.D. by 10 gage for simple nosing and 2½" O.D. by 12 gage and lighter for curling. Cycle time is 5 sec. Model 150 gives 8" to 48" lengths after forming, while Model 150-AF gives 12" to 48" lengths. Setup time is 15 to 30 minutes.

Trimble Mfg. Co., Inc., P.O. Box 109, Libertyville, Ill.

Use postpaid card. Circle No. 88

Multiple-Chamber Environmental Cabinet

Cincinnati Sub-Zero Products has announced the development of a temperature test cabinet which contains four individual chambers, each having an adjustable temperature range from -100°F to 400°F. Four components can be tested simultaneously at differ-

ent temperatures, and the air-operated vertical opening lids give access to any chamber without disturbing the other three.

Each stainless steel liquid-tight chamber measures 14" by 14" by 14", and incorporates its own U.E.C. E-32-N

indicating controller and Dickson Model MR recorder. Air circulation is accomplished by means of four blower assemblies with 1000-watt heaters.

The over-all dimensions of this Model SV-4-100-4-HC are 28" wide, 94" long, and the cabinet is 36" high. The lid assembly is 18" high and the vertical rise adds an additional 18".

Penetrated by an access port, each lid is capable of lifting 100 lbs., making

it possible to mount additional test equipment which can be raised and lowered along with the test specimen.

This model was designed for testing synchro devices, yet is equally suited for comparison testing and for use with components requiring high and low temperature cycling.

Cincinnati Sub-Zero Products, 3932 Reading Road, Cincinnati 29, Ohio.

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Versachek + Differential Switching and special fixture provides fast, accurate, low-cost method for gaging surfaces.

New Concept in Gaging and Control!

Now! High magnification, close tolerance, visual gaging with utmost accuracy and reliability, plus ease and simplicity of operation.

Versachek offers these unique features:

- Tolerances within millionths, read at a glance.
- Built-in calibration.
- Common zero for all magnifications from 400:1 to 20,000:1, or more.
- Modular design for easy interchange of units without special skills.
- Power output for operating digital recorders, printers and auxiliary equipment.

Versachek is versatile, too. Using off-the-shelf components you can use capsules to build custom fixtures and in-process gaging systems, and add modular units — multiple switchers, classifiers, digital voltmeters — to make control, sorting and feedback systems.

Find out about the many ways Versachek can Pay Off for you! Send for Versachek Catalog No. 614.

Versachek and Height Gage,
a standard gaging package

TAFT-PEIRCE GAGING

7 MECHANIC AVENUE, WOONSOCKET, RHODE ISLAND ^{TF 2-1-6}

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Over 40 sizes...with all popular tapers...in four styles...to choose from. That's how Ideal helps you meet your turning needs for the heaviest work to the lightest of light jobs.

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You can get Ideal Live Centers from your distributor's stocks. He'll give you immediate delivery service—which reduces your inventory requirements and cuts your investment costs. If you need a special, we'll be glad to work with him to meet your specifications at the right price.

SOLD THROUGH LEADING INDUSTRIAL DISTRIBUTORS
In Canada: IRVING SMITH, Ltd., Montreal



UNIVERSAL models for super accuracy to .0001, high load capacity, perfect for grinding and other high-precision work.



MULTI-DUTY models for general use, perfect for light work, interchangeable parts provide quick changeover for multi-purpose operations.



HEAVY-DUTY models for extra rugged work, give close tolerance results where high load capacity is required, accurate to .0002.



PIPE POINT models for cylindrical turning of pipe, axles and other hollow shapes, six sizes from 3 1/4" to 7 1/2" dia.

Write for new *LIVE CENTER Catalog*

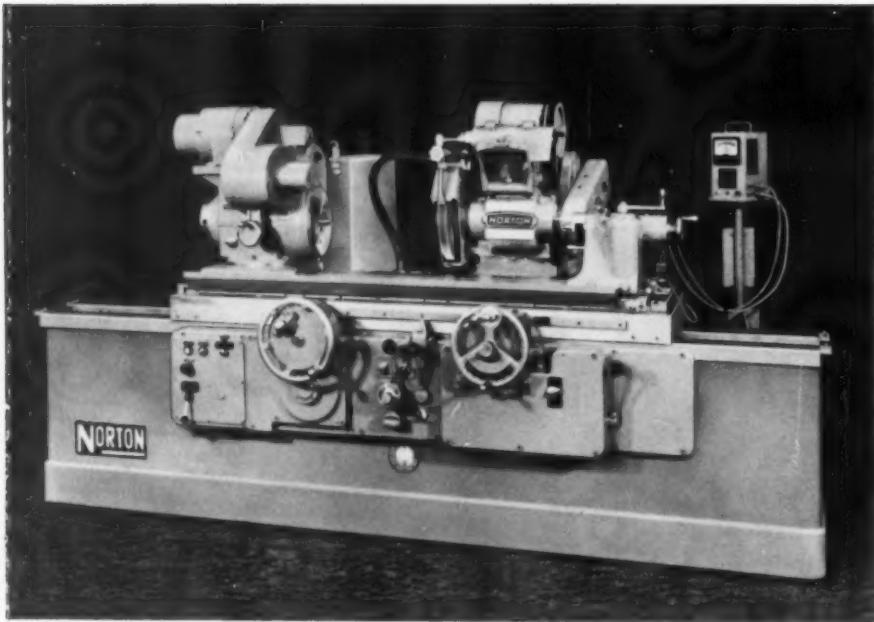
IDEAL INDUSTRIES, Inc., 1441-J Park Avenue • Sycamore, Illinois

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From the Norton

**"FIRST FAMILY" OF
TOOL ROOM MACHINES**

Universal Grinders



*Featuring extra versatility...
extra fast setups*

In a Norton Universal Grinder of any size — 10", 12", 14", and 18" — you get a practically complete grinding department. Versatility keynotes the design, with quick, easy setups for external, internal, face and angular wheelslide grinding — and with feature after feature increasing the job range and cutting tool conservation costs. For example:

Extremely rapid chucking . . . quick changeover to live or dead spindle operation . . . wide range of easily changed work speeds . . . independent wheel and feed settings for doing difficult jobs fast.

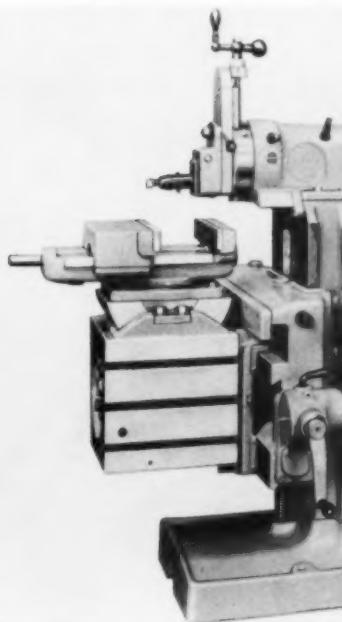
Available for use on all Norton Universal Grinders, the SWIVALIGN* Dual Electric Indicator, shown here on a 14" Type U-4, eliminates cut-and-try in establishing swivel table alignment. Ask your Norton Distributor or write for Catalogs Nos. 170, 231 and 819.

*Trade Mark Reg. U. S. Pat. Off. and Foreign Countries

From the N

**"FIRST FAM
TOOL ROOM M**

G & E Tool



The finest t

Backed by over a century of
Shapers feature 16 easily selec
many other developments with p

G&E Tool Room Shapers, in 1
panding field of shaper work an
room and heavy die work. Conve
struction enable these machines
and compound angular surfaces.

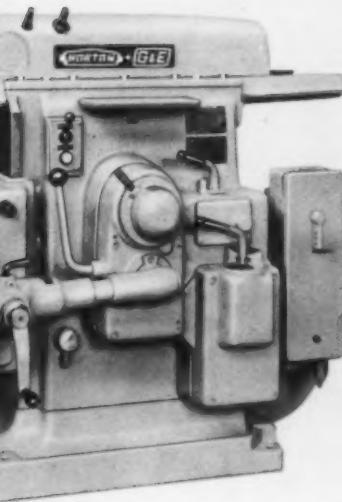
Featured on Norton-G&E Sha
constant accuracy and long life;
vides 60% more bearing area and
conveniently located for easy sele
operator can adjust table and lo
horizontal and vertical rapid tra
always operates in *opposite* dire
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ECONOMIZE with Norton Tool Room Machines

MODERNIZE with N

the Norton
"FAMILY" OF
M MACHINES

Tool Room Shapers



it for generations

y of precision machine tool building, G&E selected ram speeds, all-helical gear drive and with proved ability to cut time and costs.

in 14" and 16" sizes, meet the constantly exact and are outstanding for miscellaneous tool convenience of controls and ruggedness of construction to produce a wide range of variable flat planes.

Shapers are: Hard chrome ram V-ways for life; crossrail and table slide design that provides 50% greater rigidity; central controls are by selection of the 16 ram speeds and 18 feeds; and lock crossrail from control side; built-in traverse to work table, with safety clutch, direction to feed set. Ask your Norton-G&E catalog No. 2342.

Meet the "FIRST FAMILY" OF TOOL ROOM MACHINES



It's easy to know the Norton Family of Tool Room Machines. Their home is the modern tool room — and their scope is as broad as industry.

Above, you see them on the job — with each Norton machine adding its own special advantages to an efficient tool room operation. On the reverse side you'll find each member of the Norton family described in detail.

Specifically, the family includes a No. 200 Cutter and Tool Grinder; a Type S-3 Hydraulic Surface Grinder; a Type TS Hand Surface Grinder; a Type U-4 Universal Grinder; a Norton-G&E Shaper.

Separately or as a group, this "First Family" will bring top-ranking efficiency and economy to your own tool room — will help you maintain tools or produce jigs and fixtures that perform better . . . last longer.

For details on how Norton tool room machines can benefit your own operation see your Norton Man, a trained Machine Specialist. Or write to NORTON COMPANY, Machine Tool Division, Worcester 6, Mass.

District Offices: Worcester, Hartford, Cleveland, Chicago, Detroit; In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5.

NORTON
MACHINE TOOLS

Making better products...to make your products better

Norton Tool Room Machines

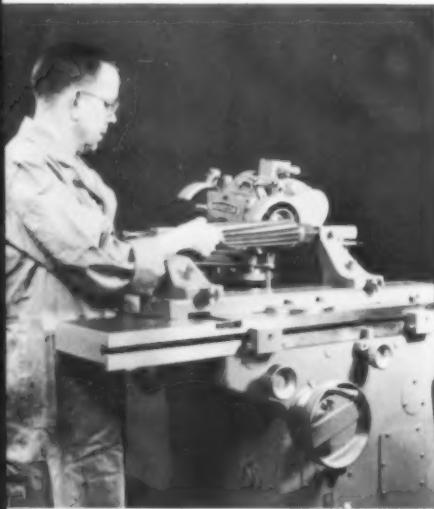
From the Norton

"FIRST FAMILY" OF
TOOL ROOM MACHINES

From the Norton

"FIRST FAMILY" OF
TOOL ROOM MACHINES

No. 200 Cutter and Tool Grinders Type S-3 Hydraulic Surface Grinders



The wheel head TILTS 30° ... ORBITS 360°!

No time-wasting "cut and try" routine with the Norton No. 200 Cutter and Tool Grinder . . . no more wrestling with tricky setups.

You can tilt the wheel head up to 15° above or below horizontal — and swivel it through a full orbit of 360°. For the first time with a tilting wheel head, the Norton two-speed grinding wheel spindle provides the right speed for large or small wheels.

A wheel head scale provides quick direct reading of clearance angles. The wheel head can be adjusted to eliminate many of the usual settings and time losses. And the table has a rugged guide bar for precision in tracking during the toughest grinding jobs.

Also, the No. 200's extremely solid grinding action brings you excellent finish on tool cutting edges, for longer lasting, better performing tools. Other features include: wheel-slide construction to eliminate possibility of work overhang; antifriction elements under table to provide fluid table motion; dual, centrally-located controls to simplify operation from any position. Ask your Norton Distributor or write for Catalog No. 1371.

FINISH FLAT

Popular for a wide variety of tool room grinding runs, Norton Type S-3 Surface Grinders offer their ability to finish smoother, faster, at lower cost.

Now, S-3 Grinders are available with a maximum table speed of 150 fpm as standard. With higher table speeds, grinding time is increased and the grinding time is reduced in the stroking rate. The faster table speeds also provide a greater wheel life that reduces heat damage to the work. Time is money.

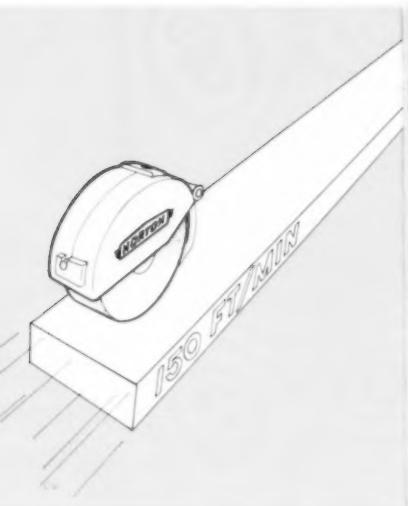
Sizes of the S-3 Grinders are 6" x 18" and 8" x 24". Both are fast, cool and accurate grinding. Taller work size and 13 3/4" on the 8" size . . . are easily handled. Features include a two-speed .0001" increment table speed and fast positioning, and contour visibility. Ask your Norton Distributor or write for Catalog No. 1371.

'OF
HINES

From the Norton

"FIRST FAMILY" OF
TOOL ROOM MACHINES

Surface Grinders



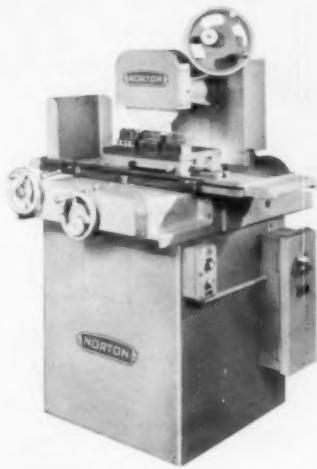
T FASTER!

m grinding, as well as long produc-
nders have given complete proof of
at lower cost.

h a new maximum table speed of
e speeds, the stock removal rate is
reased in proportion to the increase in
o provide extra cool grinding action
ime and money are saved on every

and 8" x 24", both being equally
workpieces . . . up to 15" on the 6"
ily handled. Other job-proved fea-
ment hand wheel, for accurate ver-
contoured splash guards for better
or write for Catalog No. 1772.

Type TS Hand Surface Grinders



*New...for your
daily tool room jobs!*

Available in sizes 6" x 12" and 10" x 16" the new Type TS Hand Surface Grinders bring you these typical Norton advantages for tool room machines:

Precision Performance. Wheel feed hand wheel has graduations of .0005" for fast, accurate positioning, plus a vernier scale graduated .0001" for precise grinding feeds. The long, rigid vertical slide and saddle provide greater support for moving parts, reduce vibration and improve finish. Accurate cross-feed is excellent for groove and shoulder grinding.

Easy Operation. Controls at working height are quickly accessible; design enables easy seated or standing operation. Handwheels eliminate cross-arm operation of table and cross slide. TS Grinders are the only machines of their type with hinged wheel guard for quick wheel change.

Overall Economy. Strengthened by many other simplified, long-lasting features for clean, uncluttered design which reduces maintenance costs. Ask your Norton Distributor or write for Catalog No. 388.

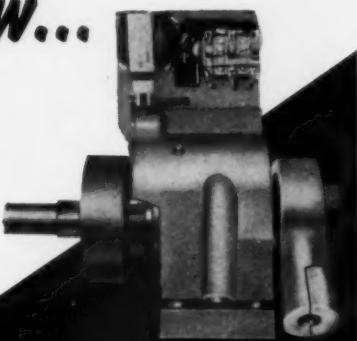
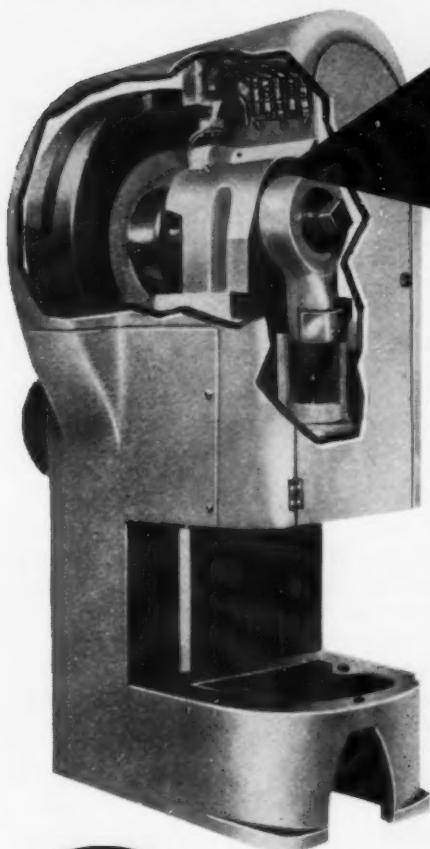
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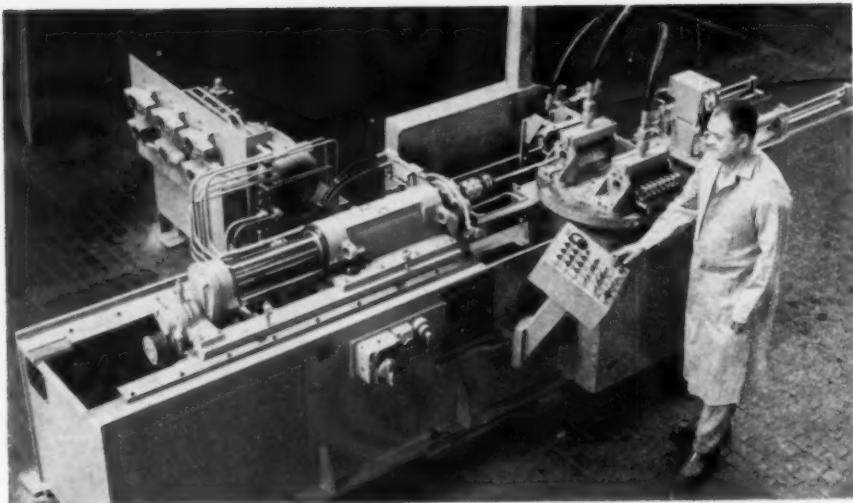
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KENCO KOMPAC . . . revolutionary in design and performance. Totally enclosed. Precision built and rugged. 400% longer single-tripping life. New self-contained, interchangeable power transmission unit...stroke changes made in minutes. Indestructible "cyclo-safe" roller clutch with solenoid-relay tripping system. 75% less starting load adds years to trouble-free service. New design efficiencies pass along a surprising savings to you . . . you'll be amazed when you find out about it! 3 & 5 Ton Models now available.

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Stack Honer

A horizontal stack honing machine, developed by Micromatic Hone Corp.,

is used for finishing such parts as connecting rods and gears, where bore length is comparatively short with re-



FREE DATA ON GEARS

This new 16-page brochure presents the essential facts and performance figures on several types of Meehanite metal.

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SANFORD MG GRINDER
and DUST COLLECTOR
in a SINGLE COMPACT
UNIT

MG GRINDER ALSO AVAILABLE FOR
DRY OR WET GRINDING
WITHOUT DUST COLLECTOR

The most widely used precision machine for unit grinding. Famous for its unsurpassed workmanship, quality and vibration-less operation. The MG is the grinder that's been "copied" but never equaled.

PARTIAL SPECIFICATIONS

GRINDER: CAPACITY — 8" x 12" x 12". TABLE TRAVEL — 13". TRANSVERSE 8 3/4". VERTICAL CLEARANCE — 12" under 7" wheel. STANDARD GRINDING WHEEL — 7" x 1/2" x 1 1/4" hole. SPINDLE SPEED — 3000 RPM. MOTOR — 1/2 HP, single or 3 phase TEBB dynamically balanced.

FLOOR SPACE — 45" x 38". 62" high on floor stand. NET WEIGHT — 600 lbs.

DUST COLLECTOR: BUILT INTO GRINDER FLOOR STAND. EXHAUST CAPACITY—650 CFM. MOTOR — 1/2 HP, 3450 RPM, single or 3 phase. NET WEIGHT — 140 lbs.



A COMPLETE DUST COLLECTOR INCORPORATED INTO GRINDER STAND.

- Exclusive design exhaust hood catches all sparks.
- Can be wired to grinder starter.
- Uses standard size filter—renewable or disposable type, or a combination of both.
- No outside exhaust needed.
- Saves floor space.
- Full size rear door gives access for cleanout.

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ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

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176

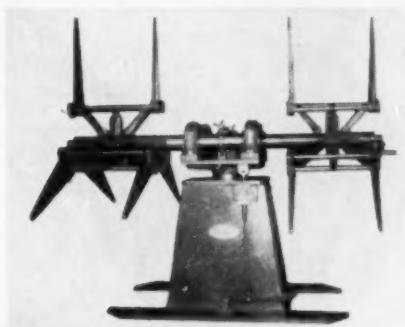
spect to bore diameter.

Designated Model 5HXH-16, this machine has a short base and a short tool which puts the work closer to the quill, thus making the tool more rigid. Accuracy also is improved by the addition of a new tool adapter which minimizes runout.

An automatic hydraulic probe pre-checks for proper clearance in the bored holes. Another feature is an integral shot-bolt locator for positive positioning of the indexing fixture.

Micromatic Home Corp., 8100 Schoolcraft Ave., Detroit 38, Mich.

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Double Stock Reel

An automatic double stock reel with a maximum weight capacity of 1500 lbs. on each side has been added to the Durant line of industrial equipment. This self-centralizing reel permits simultaneous stock loading on one side and unwinding on the other. A heavy ball-bearing turntable makes possible easy indexing of the reel. A locking device holds the coil in position for operation. Band brakes prevent overtravel of the coil while in operation.

Four sizes are available, for maximum widths of 16", 24", 32", and 36".

Durant Tool Co., 17 Thurbers Ave.,
Providence, R.I.

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TOO
SLOW
?

Emphatically not! . . . ask any visitor to the 1960 Machine Tool Exposition who watched a Marvel No. 6 Hack Saw Machine cut-off 3 $\frac{1}{4}$ " diameter 1018 steel in 27 seconds! This Saw, costing less than \$3000, was actually cutting at the rate of 18 square inches per minute!

We made the above demonstration merely to "match" what we believe to be the impractical demonstrations of some of our competitors. OUR visitors were warned that continuous cutting at this speed is economically impractical if maximum blade life and accuracy (after the first 20 cuts) are desired. They were told that the material could be cut day in and day out, at the rate of 8 square inches per minute with tool cost of approximately 1 cent per cut.

Our point? Marvel No. 6 and No. 9 Series Heavy Duty Ball Bearing Hack Saw Machines, as we build them today, have speed to spare. And they offer the most accurate, economical cut-off at the lowest initial investment.

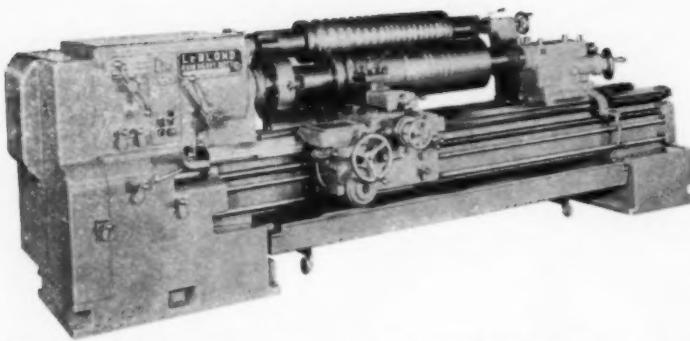
Ask your Marvel Dealer to arrange a sawing demonstration—on your own work—if you wish. Because we have consistently built both Hack Saws and Band Saws for more than 40 years, you will get an unbiased recommendation.

Catalog C60 illustrates and describes the complete line of Marvel Sawing Machines. Write for your copy.

MARVEL Metal Cutting **SAWS** BETTER MACHINES BETTER BLADES

ARMSTRONG-BLUM MANUFACTURING CO. • 5700 Bloomingdale Avenue • Chicago 39, Illinois

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40-hp Heavy-Duty Lathes

LeBlond NF 2516 and NF 3220 lathes combine rigidity and power. They are designed for turning heavy forgings and for delicate tool-room work on precision missile components as well. Lathes in these sizes are popular in ordnance and heavy machinery shops. Fitted with the company's 90° tracer, they are ideal for roll turning operations.

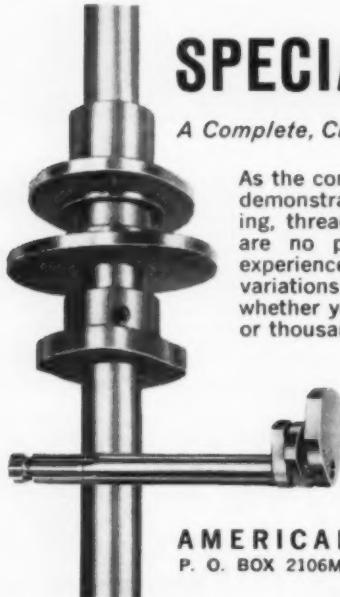
Model NF 2516 has a 25" swing over the bed, and a 16" swing over the cross slide; Model NF 3220, 32" over the bed, and 20" over the cross slide.

Both models have 36 spindle speeds, in three ranges, from 10 to 1300 rpm. They offer 60 feed and thread changes, with standard feeds ranging from .0045" to .269". Both are rated for 40-hp motors.

Spindle speeds are selected through

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As the complex special cams shown here demonstrate, precision cam shaft grinding, threading, splining and gear cutting are no problem for AMCAM. We are experienced in handling all types of cam variations from design to delivery, whether you need one or thousands.

We will be glad to visit your plant to analyze needs and submit recommendations . . . or send us your specifications for prompt estimate.

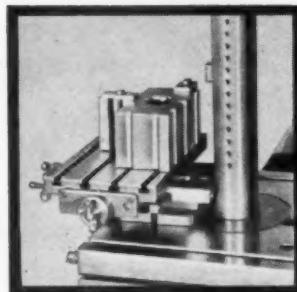
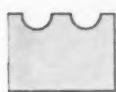
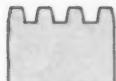


AMERICAN CAM COMPANY INC.
P. O. BOX 2106MT, HARTFORD, CONNECTICUT

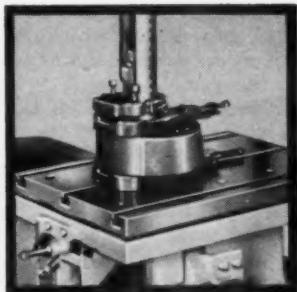


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PERFORM SPECIAL PRODUCTION JOBS ON HYDRAULIC M&M KEYSEATER AND VERTICAL CUTTING MACHINE



Set-up for external cutting



Set-up for internal cutting



The new Mitts & Merrill Keyseater and Vertical Cutting Machine can be easily adapted to cutting splines, serrations and die profiles both internal and external, by adding simple fixtures.

With combination tilting table and index table, straight or tapered bores and accurately spaced multiple keyways or splines may be cut at any degree of the circle, with internal keyways up to 3" wide x 24" long.

Hydraulic drive gives smooth performance and faster machining; stroke and feed as well as tool relief are automatic, assuring exceptional accuracy.

Mechanical drive keyseaters also available. Send us prints of your cutting problems.

BUILDERS OF MACHINERY
SINCE 1854

M&M KEYSEATERS AND
VERTICAL CUTTING MACHINES

112

MITTS & MERRILL • 1015 So. Water St. • SAGINAW, MICHIGAN

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an all-spur-gear drive which operates according to LeBlond's no-load principle, in which only gears and shafts transmitting power are in motion, providing lowest possible power loss and maximum efficiency. Bed ways are hardened and ground, and replaceable.

Both lathes can be obtained in tool room models. The NF 2516 is also built in a plain bed gap model, which increases the swing approximately 50 per cent through the gap.

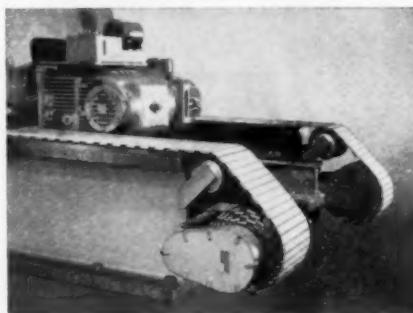
R. K. LeBlond Machine Tool Co., Cincinnati, Ohio.

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Spring Take-Up Motor For Way Curtains

Futurmill, Inc. has announced a totally enclosed spring take-up motor with constant torque recoil for practically any length of its Way-Life curtains. This feature eliminates cone and

cable assemblies and other similar methods of winding curtains. The motor can be adapted to either one end or both ends of a machine. The extruded aluminum curtains are strong enough for operators to walk on. No mainte-



nance is required and all parts are replaceable.

Futurmill, Inc., 19720 W. Eight Mile Road, Southfield, Mich.

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SPECIFY
Spraymist®



BIJUR ENGINEERED FOR PRECISION MIST CONTROL

Only Spraymist provides these exclusive features

- Mist forms at the Jet Tip . . . not in the unit, preventing loss of coolant due to condensation—yielding high efficiency and economy in operation. Needle Valve at each jet tip conveniently controls uniform, continuous mist—from superfine to heavy spray permits multiple jet operation. Easily replaced jet tips.
- Compact Unit Design—Includes ALL necessary controls: Trap-Filters—Regulator—Gauge—Solenoid Valve—Reservoir.
- Automatic Operation—Mist starts and stops automatically as it is tied in the operation of your machine.
- Built to Last—Sturdy construction—Choice of 18 ounce, 1 gallon or 5 gallon units.

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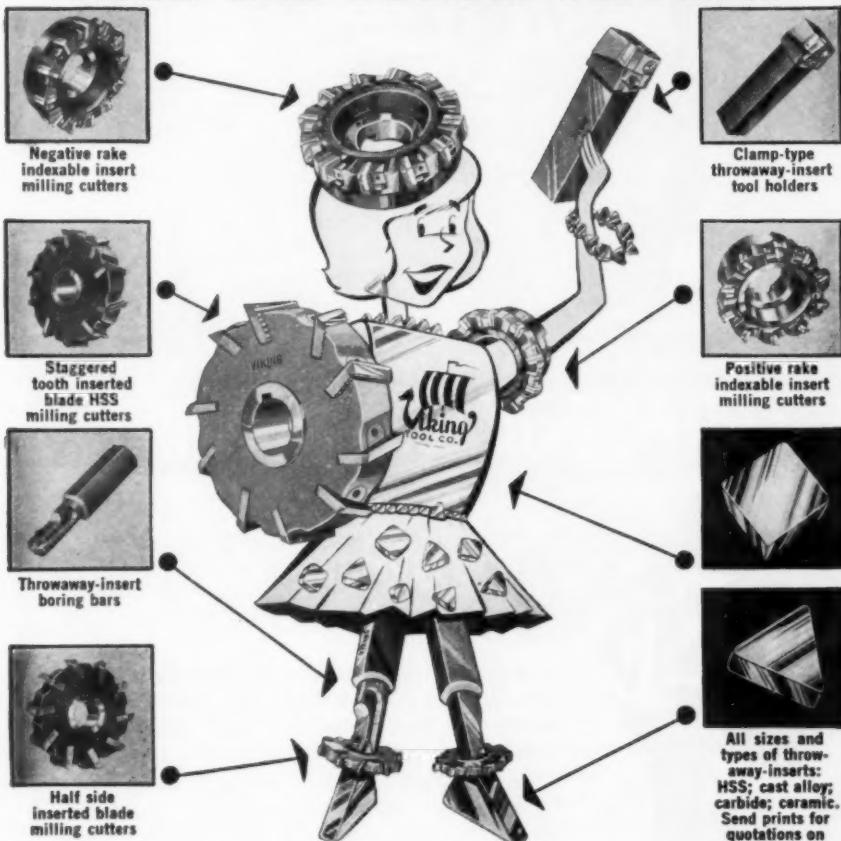
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MACHINE and TOOL BLUE BOOK

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The wise way to buy Carbide, High Speed Steel, Cast Alloy and Ceramic Throwaway-Inserts, and Tool Holders, Milling Cutters, and Boring Bars is to buy from one knowledgeable source. Viking tool engineers know the applications of not merely one of these items, but of all of them as they so vitally relate to each other in order to obtain maximum cutting performance with minimum loss in time and materials. Because Viking engineers are pioneers in the throwaway-insert and tool industry, they are uniquely able to recommend the right tool and/or insert for your particular need. They are at your service.

ASK FOR AN INTRODUCTION



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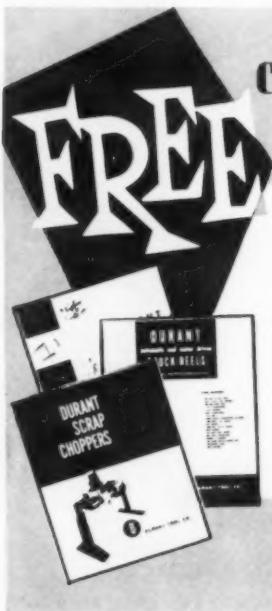
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Automatic Shear-Welder

An automatic combination shear and welder has been developed by Guild

Metal Joining Equipment Co. Model D4-250 provides continuous strip, using any thickness from .040" to .250", for



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MACHINE and TOOL BLUE BOOK

**Transform your stubborn mule
to a prime mover**



**PROVED...
TURRET LATHE AUTOMATION**

**by Acme
HYDRIVE**

Hydrive transforms older turret lathes from limiting factors to high volume producers! Technical management is being stimulated to machine tool re-evaluation in view of the proved success of automating turret lathes with Hydrive. Stepping up manual turret lathes to automatic operation—easily capable of tripling output—will multiply your capacity at surprisingly low cost. Without the substantial expenditure of new equipment, management reaches increased production goals . . . with wanted accuracy and reliability.

Write today for complete Hydrive information . . . how Hydrive will make your turret lathe far more productive. Also available upon request, FREE Hydrive film.

ACME INDUSTRIAL COMPANY

200 North Laflin Street/ Chicago 7, Illinois

Use postpaid card. Circle No. 291

October, 1961

183

Gaertner Optical Instrumentation
designed and manufactured in the U.S.A.



Coordinate Cathetometers reduce inspection time

Gaertner Coordinate Cathetometers are reliable optical instruments for making precise measurements in the vertical plane. Because they permit reading two coordinates in a single setting, they reduce inspection time and eliminate resetting errors.

In addition to the routine inspection applications, these instruments permit measurements on larger objects as well as objects or points in recessed, remote or inaccessible locations. They eliminate the errors and indecisions associated with mechanical-contact measurements.

Illustrated is Gaertner's M1238-1818 instrument. It has a range of 18" x 18", working distance of 9" to infinity, and reads to .0001" up to 24" working distance. Protractor ocular reads up to 3 minutes of arc. Larger ranges are available. Smaller types provide reading to 0.0001".

Write for Bulletin 194-57

Use postpaid card. Circle No. 292

1221 Wrightwood Ave., Chicago 14, Ill., BU 1-5335

roll forming, tub manufacturing, punch press operation, and coil-strip processing lines.

The shear and end welder automatically aligns the trailing end of a processed coil and the leading end of the new coil, clamps both ends, shears, sets the two ends at the proper gap for arc welding, and automatically welds the strips together with little or no increase in joint thickness over the parent metal.

Welding speeds range from 90 ipm on .060" thick steel to 50 ipm on .250" thick steel. Complete time for clamping, shearing, and welding ranges from 40 to 60 sec., depending on material thickness and width. Any width from 2" to 17" can be processed.

Both steel strips are held in positive alignment during the shearing and welding cycles. Ends are sheared and welded on a 5° angle also. Flash removal is not required.

Guild Metal Joining Equipment Co.,
7280 Wright Ave., Bedford, Ohio.

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Lapping Machine

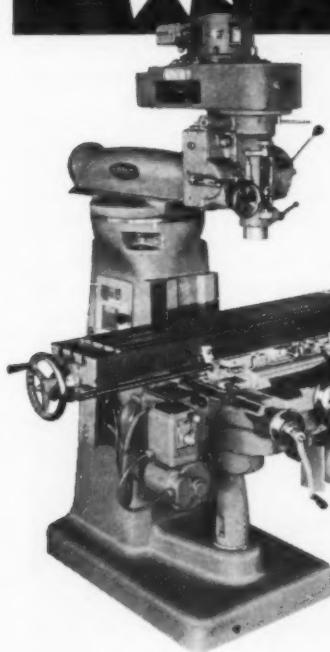
A redesigned Model 36 Lapmaster features a new abrasive distribution system which maintains the correct mixture of compound-to-vehicle from initial filling to the last drop. Pressure pumping at a constant head assures uniform deposit at the lapping stations. It also provides an adjustable flow control to obtain maximum stock removal. The pump and tank are mounted on the inside of the door in the machine base, which swings out for filling ease, but is out of the way during production.

The equipment provides ultimate working efficiency within the smallest possible floor area. The large, wrap-around, adjustable work table that can be raised or lowered to be in the same plane with the lapping plate, and a remote start and stop station permits

Gaertner
SCIENTIFIC CORPORATION

NEW

"645" BETTER SIX WAYS



**WRITE FOR YOUR COPIES OF 4-PAGE
DESCRIPTIVE BROCHURES PACKED
WITH FACTS ON NEW MODEL "645"
HEAVY DUTY "55" VERTICAL MILL
AND
MODEL "60" HORIZONTAL MILL.**

• GREATER RANGE—

In EVERY category than ANY machine in its class • 25½" of ram travel • Spindle to table and spindle to column—Range greatly exceeds competitive machines, PLUS many other dimension advantages.

• GREATER ACCURACY—

Ground lead screws • Hand scraped ways • Overarm stays in one plane • Locks without distortion • Tool room accuracy in manufacture of components.

• GREATER VERSATILITY—

Head tilts 45° forward and back, rotates 360° on ram • Turret rotates 360° on column • Power assembly rotates 360° around spindle • Many other features.

• GREATER EFFICIENCY—

Convenient controls • 9 spindle speeds, 3 power spindle feeds (up or down) • 4-way head handles any compound work angle • Greater work area.

• GREATER DURABILITY—

Index quality throughout for long trouble-free life.

• PROVEN ACCESSORIES AND EXTRA EQUIPMENT—

Ask for catalog and prices.

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MACHINE COMPANY
540 N. MECHANIC ST.
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JACKSON, MICHIGAN

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easier loading and unloading of parts from almost any position.

A conveniently located main control column includes an automatic timer for pre-setting the lapping cycle. A hand screw is provided for easy adjustment of the conditioning ring to compensate for normal wear patterns in the lapping plate.

The machine comes with either three or four conditioning rings, and is also available with pneumatic lifts to facilitate raising and lowering of the rings and pressure plates. Lapping can be performed on a production basis within tolerances of one light band or less, and uniform micro-inch finishes of 2 to 3.

Crane Packing Co., Dept. MB-3, 6400 Oakton Street, Morton Grove, Ill.
Use postpaid card. Circle No. 95

Furnace Has Choice of Quenches

Lindberg Engineering Co. has announced a tube-type furnace, manually operated for heat treating metals. One prime feature is a choice of quenches. A chute between the heat chamber and the cooling jacket permits either an oil quench or atmosphere cooling.

Automatic flame curtains at the entry or charging door, as well as at the discharge door, prevent the infiltration of air into the muffle.

This furnace has a 6" I.D. Inconel

for precision,
carbide-tipped

EXPANSION REAMERS

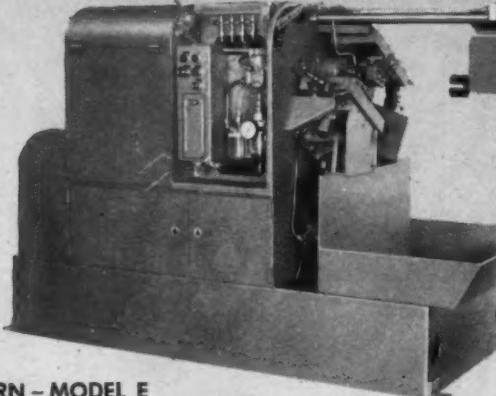
... as you have known them over the years, turn to Carr Tool Co. You'll find the team you've trusted in the past will furnish your needs for precision, carbide-tipped expansion reamers—standard or special—solid reamers, end mills, counterbores and core drills, as before.

Prompt quotations and fast service—send prints and specifications. New, 16-page illustrated catalog mailed on request.

Carr TOOL CO., 3809 HIRES LANE, CINCINNATI 12, OHIO

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HIGH SPEED, AUTOMATIC CUTTING-OFF MACHINES



MODERN - MODEL E

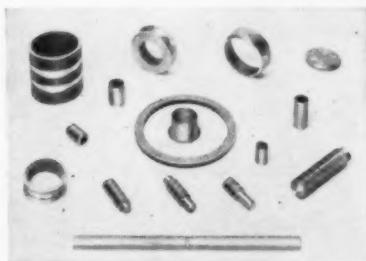
Increase production, lower costs and cut any material that can be turned — bar stock up to 3" O. D. — tubing up to 8" O. D., to lengths from a fraction of an inch to several feet, with micrometer accuracy. Ideal for use with carbide tools.

We also engineer and build machines — using the same bodies and spindles — for such operations as trimming ends of drawn shells and filler caps. Send prints for quotes.

OUTSTANDING FEATURES

- Simple design
- 16 spindle speeds
- Circulating oil system
- Square lathe cuts
- One second index time
- Fast set-up change — from one diameter and length to another. Any tool can be changed without disturbing others.
- All cams, adjustments and working parts for cross slide are outside for quick, easy adjustment.
- Chip pan slides out, for easy dumping.
- Power, speed and rigidity for cast alloy and carbide blades.
- Special spindle bearing takes all collet thrust. No thrust on main taper roller spindle bearings.

Catalog and production figures mailed on request.



We can furnish special tooling to meet your requirements — to cut-off, form, groove, flange and chamfer in a single operation, at a high rate of speed. Send prints.



MODERN MACHINE TOOL COMPANY
2005 Losey Street • Jackson, Michigan

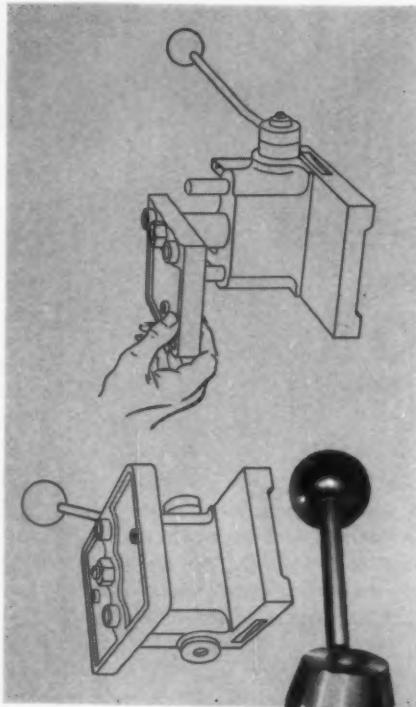
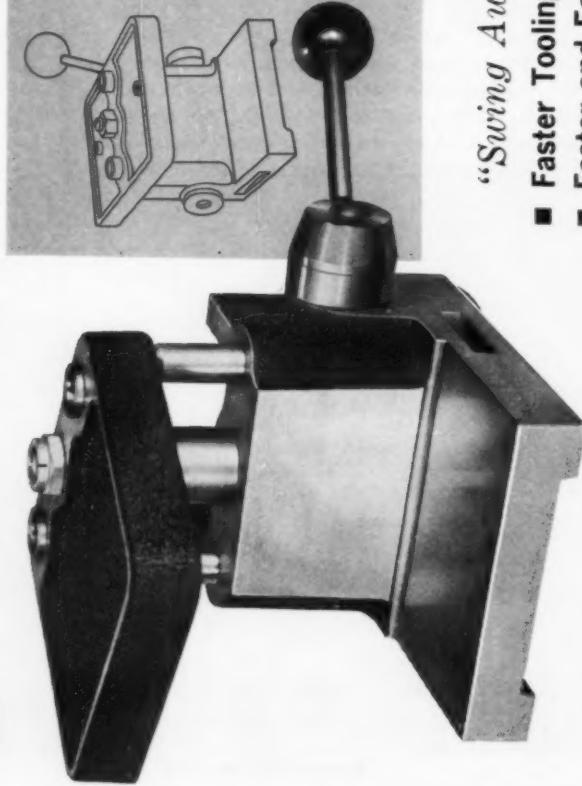
Use postpaid card. Circle No. 295

October, 1961

tool quickly for long or short runs!



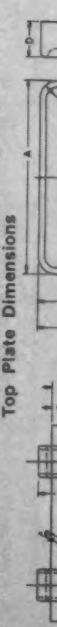
LIFT SWING DRILLING FIXTURES



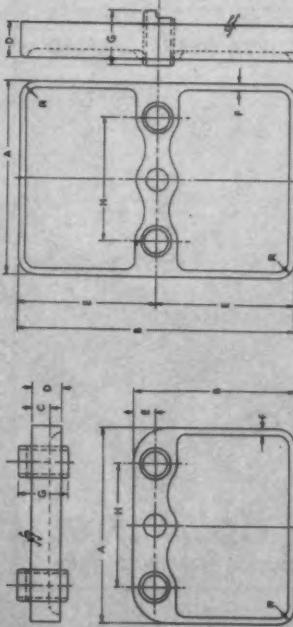
"Swing Away" features give you . . .

- Faster Tooling-Up
- Faster and Easier Drilling Operations
- Choice of Single or Double Top Plates

INTERCHANGEABLE TOP PLATE ENGINEERING DATA



Style 1 Single



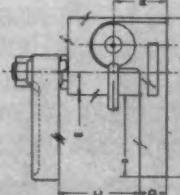
Top Plate Dimensions

Larger sizes and other style single top plates available.

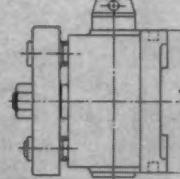
IMPORTANT: When ordering Complete Assembled Lift Swings, specify first 3 digits of Base Number and 1 or 4 to indicate the style of Top Plate desired. EXAMPLE: LS-3221 = 3220 Base with 3201 (Style 1) Top Plate.

FIXTURE BASE ENGINEERING DATA

Fixture Base Dimensions



Front View
(Top Plate Removed)



Side View

Fixture Base Sizes

Lift Swing Base Number	A	B	C	C Shut suggested max. clamp	D	E	F	G	H	R
2220	2½	1½	1½	2½	1	½	¾	¾	1½	½
3220	3½	2½	2½	3½	3	1	¾	¾	1½	½
4220	4½	2½	2½	3½	1	½	½	½	2½	½
5330	5½	3½	3	3½	4½	1	1	½	3½	2
5340	5½	3½	4	4½	5½	1	1	½	3½	2
5350	5½	3½	5	5½	6½	1	1	½	3½	2

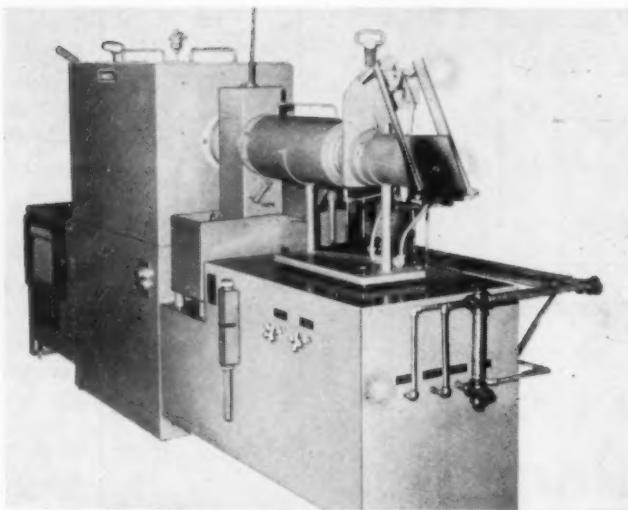
Larger sizes available. For tooling suggestions and complete engineering data write for Catalog LS-60.



ACCURATE BUSHING COMPANY

444 North Avenue, Garwood, N. J.

Use postpaid card. Circle No. 296



muffle, a 20" heat chamber, a 20" water-jacketed cooling jacket, and a maximum heating temperature of

2000°F.

Lindberg Engineering Co., 2450 W. Hubbard St., Chicago 12, Ill.

Use postpaid card. Circle No. 96

EISLER MAKES OVER 300 DIFFERENT TYPES OF INDEXING TURNTABLES WITH INDEXING DRIVES OF ALL KINDS. CAMS — GENEVA GEARS — SPEED REDUCERS AND VARIABLE SPEED CONTROLS. SPECIAL INDEXING TURNTABLES BUILT TO YOUR SPECS.



NO. 88-GT-B 6 POSITION INDEXING TURNTABLE
GENEVA GEAR DRIVE SYNCHRONIZED
WITH AIR OPERATED PRESS
INDEXING TIME TO SUIT WORK



EISLER ENGINEERING CO., INC.
762 SOUTH 13th STREET

NEWARK 3, NEW JERSEY

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SELL the metalworking market for a full year through **HITCHCOCK'S MACHINE AND TOOL DIRECTORY**

HITCHCOCK'S MACHINE and TOOL DIRECTORY has been serving the metalworking industry since 1951 and is a primary source for the purchase of metalworking equipment and supplies.

Over 30,000 copies of the Directory are used and reused for a full year by the prime buying influences at the time of selection and purchase. Surveys indicate that 14 people in the typical metalworking plant have access to the Directory. This use factor of 14 people per Directory multiplied by 30,000 copies shows that the Directory has a potential audience of 420,000 users.

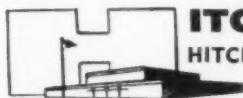
Following are the titles of the men who will receive the 30,000 copies of the Directory.

Executives	5,290
Production Management	8,767
Departmental Management	3,217
Engineering	9,451
Purchasing	1,161
Other Titles	43
Non-Manufacturing Industries	1,103
All Others	1,968

A full page black and white advertisement in the Directory costs \$420.00. This means that you can reach each of the 420,000 users for 1/10 of a cent a day. Figured on a 5 day week, there are 250 days in a year that the Directory is used. Your page advertisement costs you only \$1.68 per day.

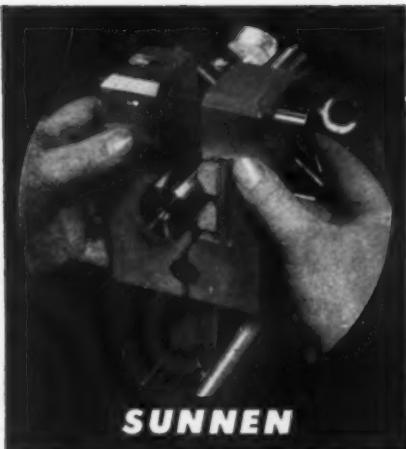
The opportunity to advertise in HITCHCOCK'S MACHINE and TOOL DIRECTORY comes only once a year so make immediate plans and be sure that your sales message is seen at the time the men of the metalworking industry are ready to buy. Advertising in the 1962 edition closes October 16.

Write, wire or call for complete details.



ITCHCOCK PUBLISHING CO.
HITCHCOCK BUILDING, WHEATON, ILLINOIS

Publishers of Business Magazines and Directories Since 1898



SUNNEN

EXTERNAL HONES

**SAVE MANY HOURS IN YOUR
TOOL ROOM OR MACHINE SHOP**

They produce exact size, mating fit or surface finish on O.D.'s of... plug gages, shafts, arbors, spindles, pistons, plungers, leader pins, ejector pins...many others.

Guaranteed to produce geometric accuracy to "split-tenths" with surface finish as low as 2 micro-inches.

They correct all errors such as waviness, centerless grind chatter, bow and taper. Invaluable in production, job lot or tool room work.

They combine speed of honing with precision of lapping. Parts to be honed can be driven by lathe or Sunnen Honing Machine.

Available in 4 sets:

$\frac{1}{8}$ " - $\frac{13}{32}$ ", $\frac{13}{32}$ " - $\frac{13}{16}$ ",
 $\frac{13}{16}$ " - $1\frac{1}{2}$ ", $1\frac{1}{2}$ " - $2\frac{3}{4}$ " diameters.

WRITE FOR FREE BOOKLET

Find out how SUNNEN
EXTERNAL HONES
can help you.

7899



SUNNEN
PRODUCTS COMPANY
HONING

7922 Manchester Ave. • St. Louis 17, Mo.
Canadian Factory: Chatham, Ontario

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192

Reciprocating Feed System For Deep Hole Drilling

A reciprocating feed arrangement has been added to the Burgmaster line of automatic bench model turret drilling machines. This arrangement permits drilling to a certain depth; retracting to the top of the workpiece; rapid traversing down to the previous stopping point of the drill; drilling another increment (as desired); retracting to the top of the work to clear chips; and then repeating the cycle until final depth is reached. At this point, the drill is rapid traversed to

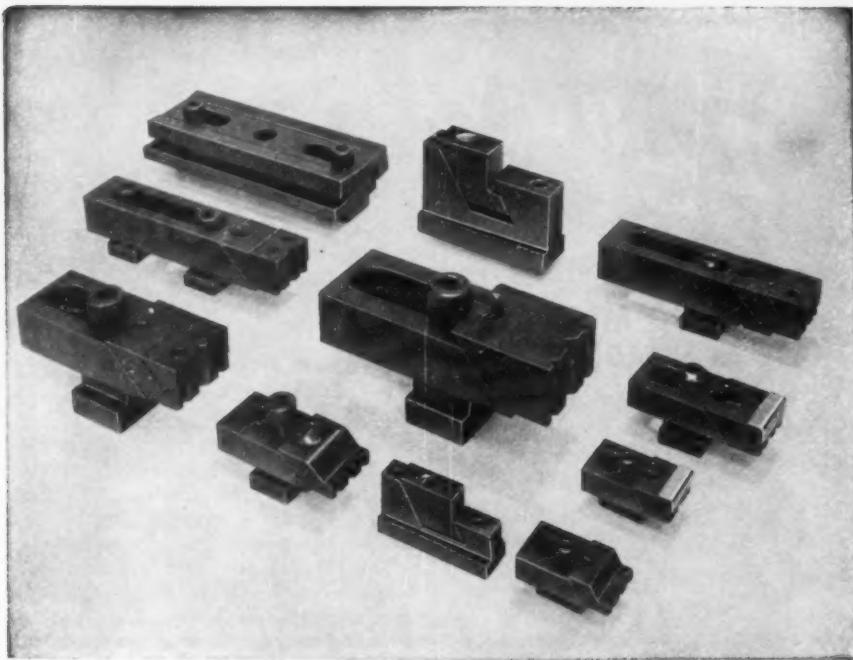


the top of the stroke and indexed to the next tool.

Depth setting and rapid traverse are set on an electronic device to control the depth for each stroke and withdraw the drill any number of times to suit the work involved. Extremely small holes can be drilled with this feed which also permits a range of speeds from 350 to 21,000 rpm.

Burgmaster Corp., Small Tool Division, 15001 S. Figueroa, Gardena, Calif.
Use postpaid card. Circle No. 97

MACHINE and TOOL BLUE BOOK



Where you can get...

DOWN-HOLDING DEVICES for any machine table or face plate

J & S All-Purpose Jaw Clamps eliminate U-Clamps, Straps and Fingers for lathes, planers, milling machines, boring millers, jig borers, etc.

Faster Set-up with any of the 5 Models of J & S Jaw Clamps—one adjusting screw has a holding force of $2\frac{1}{2}$ tons on the Small Model, to 12 tons on Jumbo Model for positioning and holding the work-piece.

Single powerful clamping action obtained from the 45° angle inward and downward movement of the jaw clamp is easily applied and controlled.

Compact, efficient design of J & S Jaw Clamps eliminates the usual obstruction problems — no interference with measuring tool readings.

See your industrial distributor or write today for free literature.

J & S TOOL CO., INC.

882 DORSA AVE., LIVINGSTON, N. J.

WYman 2-3181

Use postpaid card. Circle No. 298

for as little as
\$22.00
 COMPLETE
 IN U.S.A.

Get This Production Boosting
"TRICO-MIST"
COOLANT SYSTEM

*Increase Production And Tool
 Life As Much As 500%*



For drilling, tapping, milling, sawing, grinding, etc. Removes heat from cutting edges of tools and work. Feeds can be increased considerably, finer finishes and accuracy are obtained. TRICO-MIST absorbs heat, thereby quenching it faster than flood coolants which only transfer it. Chips slide freely up the tool face and are blown away automatically. Simple needle valve controls size and volume of mist spray. Attaches to shop air line. Available with one and five gallon containers—single or multiple outlets—single or dual valve control.

SEND FOR BULLETIN 37

TRICO FUSE MFG. CO.
 MILWAUKEE WIS. U.S.A.

Use postpaid card. Circle No. 300



**Elevating Feed Table
 And Transport Truck**

A mechanical combination sheet and plate elevating table and transport truck has been developed by Jarke Mfg. Co. for feeding metal sheet and plate stock to punch presses, shears, and similar equipment.

This Model 600 Steelmobile Senior is powered by a $\frac{3}{4}$ hp., right-angle gear motor with brake. The truck is mounted on four casters equipped with swivel locks enabling either end to trail. It will tow from either end under full load.

The Steelmobile is rated at 6000 lbs. capacity with a choice of two top sizes, 36" by 96" or 36" by 120". The table elevates from 20" to 36". It is equipped with pedal or push-button control of the top.

Jarke Mfg. Co., 6333 Howard St., Chicago 48, Ill.

Use postpaid card. Circle No. 98

Vibratory Finishing Machine

A 6 cu. ft. capacity finishing machine uses a resonant electro-magnetic system to give shaking forces up to 50 Gs, and features only one moving part, the tub. Shaking force is from zero to $5/16$ " amplitude, and power is standard 220-volt AC, operating through three pairs of epoxy impregnated and encapsulated magnets. The air-dumped



CONTINUOUS FORMING CONTROL

di-acro
PRECISION
METALWORKING
EQUIPMENT

25 TON HYDRAULIC PRESS BRAKE

pronounced die-ack-ro

It takes less than 15 seconds to pre-set the length of stroke for most efficient operation and maximum safety. The rapid, dual speed work cycle provides fast approach, slow work and fast return—or a stroke as slow as 6 operations per minute. It's easy to "inch" the ram or reverse it at any point in the stroke. Dangerous sheet whipping with resultant costly kinking can be virtually eliminated. This dependable 25 ton hydraulic press brake is available in 6 and 8 foot bed sizes.

Designed for high speed, economical forming and fabricating of small parts. The 12 Ton series uses standard press dies and is practical for short run production and sample work. Available with 3 or 4 foot bed.

A complete selection of press brake dies for bending, blanking, box forming, corrugating, curling, hemming, punching and flattening. Fits all standard press brakes.

Di-Acro Rol-Form Dies eliminate work marking of highly polished or painted materials. Saves time and reduces die costs—one die does the job of many.

Consult the Yellow Pages of your telephone book under Machinery—Machine Tools for the name of your nearest Di-Acro distributor or write us.



Please Send Complete
Details On:

- 25 Ton Hydraulic Press Brake
- Standard Press Brake Dies
- 12 Ton Hydraulic Press Brake
- Rol-Form Dies

DI-ACRO CORPORATION

formerly O'Neil-Irwin Mfg. Co.

6010 Eighth Avenue, Lake City, Minnesota

NAME: _____

COMPANY: _____

ADDRESS: _____

CITY: _____

STATE: _____

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Angle Tangent to Radius WHEEL DRESSING *Simplified*

WITH
ROTHFUSS TOOLS



**THE G-5
RADIUS DRESSER** is a precision engineered tool that will dress either a convex or a concave radius from .015" to 1.750" on all wheels up to 10" and it may be set to the exact radii desired. Graduated stops allow you to dress any desired portion of a radius. The spring tension journal insures chatter free operation. Price \$80.50



Price \$87.50



All for only
\$149.50

(including case
and both tools
with diamonds)

Distributorship available in select territories

ROTHFUSS TOOL

COMPANY

BOX 2694 ELMWOOD STATION

PROVIDENCE 7, R. I.

Use postpaid card. Circle No. 302



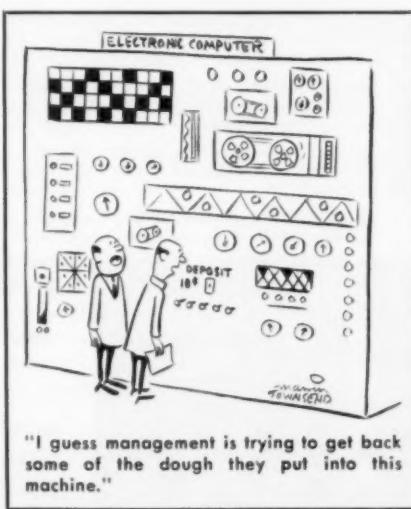
tub is 37" by 20" by 15" deep, and holds a 750-lb. charge.

This Model V-600 is for deburring, radii-forming, descaling, flash removal, cleaning, and polishing.

Vibrodyne Division, Globe Industries, Inc., 125 Sunrise Place, Dayton 7, Ohio.
Use postpaid card. Circle No. 99

Heavy-Duty Cut-Off Machine

Stone Machinery Co. announces the addition of the M-160 heavy-duty, high-speed metal cut-off machine to its present line. This rugged 15-hp machine will handle a wide range of ferrous and non-ferrous cutting jobs. A geared-in-head feature is said to



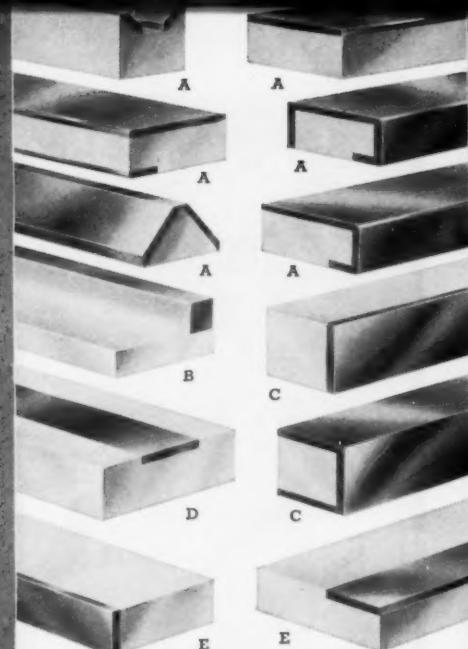
"I guess management is trying to get back some of the dough they put into this machine."

- A—Hardened Ways and Slides
- B—Composite Die Sections
- C—Heel Block
- D—Center Clad
- E—Flange Slide

**save
save
save with
OHIO KNIFE CO.**

hardened
ways
and
wear
plates

For FREE copy of 16-page
Bulletin-A, giving complete data on OK
ways, etc., write Dept. 123-D



NEW SHAPES—12 cross sections.

NEW USES—for dies, die sections, flange sections, ways, gibs, rails.

88 SIZES—every practical width and height up to 168" length.

65-66 ROCKWELL—to full depth of tool steel along entire length.

READY TO USE—delivered with cutting, forming, wearing surface machined, hardened and ground. Soft steel backing quickly drilled.

LOWER PRICES—production in large quantities enables us to price them below yours or other makes.

DELIVERY FROM STOCK — to five weeks on all sections including clad aluminum bronze.

Use postpaid card. Circle No. 303

THE OHIO KNIFE CO.
CINCINNATI 23, OHIO

LOW COST WAY TO CUT GRINDING COSTS



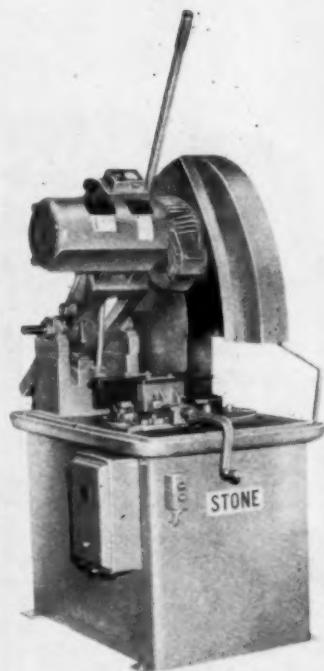
When you dress grinding wheels regularly you clean loaded pores, uncover fresh abrasive grains—**GET NEW PERFORMANCE AGAIN AND AGAIN.** Dressing makes every wheel more efficient. In the complete Desmond line there is a dresser to meet your requirement—at low cost. A typical Desmond-Huntington dresser* costs less than \$3.00; replaceable cutter sets average 36c. Ask your Desmond distributor's advice.

*The only complete line of
grinding wheel dressers and cutters*

Desmond

Desmond-Stephan Mfg. Co.
Urbana, Ohio

Use postpaid card. Circle No. 304



produce high efficiency of power transmission from motor to spindle.

It is available in either 20" or 24" size, with stationary wheel guard for operator safety, and can be equipped for wet or dry cutting, as well as manual, semi-automatic or fully-automatic operation. A fast-acting, self-centering vise with adjustable jaws clamps work close to the cutting edge, regardless of angle. Stone Machinery Co., Manlius, N.Y.

Use postpaid card. Circle No. 100

Utility Presses

A line of hydraulic ram type or guided platen Series I industrial utility presses has been announced by the Hannifin Co., Des Plaines, Ill., a divi-

**1185 DOLLARS BUYS THIS
CLAUSING 1-1/16" Collet Capacity Lathe**



and look what you get

- **VERIFIED ACCURACY** — guaranteed by 16 precision tests documented for you in reports accompanying each lathe.
- **FLAME HARDENED BED WAYS** — "accuracy protection" which costs many dollars more on other lathes.
- **BIG FORGED SPINDLE** — $1\frac{3}{8}$ " bore, $1\frac{1}{16}$ " collet capacity.
- **"ZERO PRECISION" TIMKEN SPINDLE BEARINGS**.
- **SHAVED GEARS** — another CLAUSING "exclusive" assuring greater accuracy and smoothness.
- **BIG CAPACITY** — No. 5418 (illustrated) has $12\frac{3}{4}$ " swing, 23" between centers, 10-speed ball bearing countershaft. Takes up to $1\frac{1}{2}$ HP motor, extra. Also available with 35" ad 48 $\frac{1}{2}$ " centers, and with variable speed drive, clutch and brake, L-00 spindle.

These, and other features—plus low initial investment—make the Clausing the greatest value in lathe history! Write today for full information.

CLAUSING
DIVISION OF
ATLAS PRESS COMPANY

OUTSTANDING VALUES IN PRECISION MACHINES



10-109 N. PITCHER STREET, KALAMAZOO, MICHIGAN

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GREIST - H.B. MICRO-HEIGHT® GAGES FOR FAST MEASURING, LAYOUT AND INSPECTION

Easy-to-read micrometer gage scribes like a vernier height gage. Measures up to 11" with risers, with accuracy of $\pm .0005"$. Machine cut gradations in .100" on barrel, .001" on head. Dial indicator attaches for quick measuring between holes and surfaces. All working parts are hardened and ground, adjustable for wear. Glare-free satin-chrome finish. Comes complete with carbide scriber, indicator holder and case.

Micro-Height "2." Reads
directly from 0 to 3" \$53.00

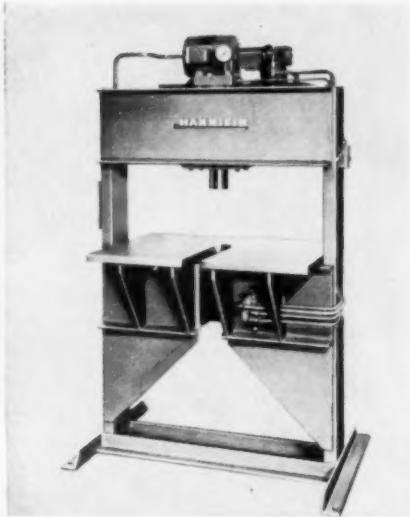
Micro-Height "4." Reads
directly from 0 to 5" \$73.50

Immediate delivery from stock. Write for
name of your nearest dealer.



2 COMMERCE ST.
CHATHAM,
NEW JERSEY
MERCURY 5-7787

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200



sion of Parker-Hannifin Corp. These presses feature a "component selection" concept which makes possible a broad choice of standard frames, working forces, speeds, circuits, controls, and power sources.

Structural steel frames meet NMTBA deflection standards. 25-, 50-, 75- and 100-ton capacities are offered in both ram type and guided platen models, with a choice of 24" x 24" or 36" x 24" die areas. Seven power sources are available to provide a wide range of press speeds. There are also seven electrical control systems, as well as manual control and sensitive pressure control.

Hannifin Co., Dept. 130, 501 S. Wolf Road, Des Plaines, Ill.

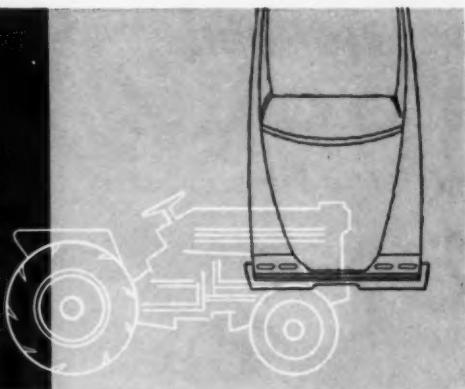
Use postpaid card. Circle No. 101

Coolant Tanks and Pumps

Brown & Sharpe Mfg. Co. announces two tank and pump units for supplying coolant to machine tools. Tanks are 16 and 32 gal. capacity, with two baffles to aid in settling chips and sludge.

The tanks are equipped with a $\frac{1}{8}$ -hp midget Hi-Flo centrifugal pump which

QUALITY
PRODUCTS
demand



CLEEREMAN SERIES A, AUTOMATIC CYCLE, **DRILLING AND TAPPING MACHINES**

To meet the needs of industry for precision parts for quality products, Cleereman has developed a full line of Drilling and Tapping Machines.

The latest developments of the Series "A" are Special Purpose Arrangements for small lots or production runs.

- Two or more columns can be mounted on a special base.
- High precision production through use of rotary type index tables.
- The building block concept provides low cost initial investment and basic machine elements for changeover to new and different piece parts.
- Complete automatic cycle push button operation at all stations.
- Ease of set-up, pick-off change gears, broad range of speeds, feeds and tap leads.

PHONE, WIRE, OR WRITE

**CLEEREMAN
MACHINE TOOL CORP.**

General Distributor: The Jackson-Fotsch Co.
7358 W. Lawrence Avenue, Chicago 31, Illinois

Factory: Green Bay, Wisconsin

Special Purpose Series "A" with
Rotary Type Index Table.

Use postpaid card. Circle No. 307

Specialized TOOLS

that Rate a Place
in your
Tool Crib



The cost of Walton Specialized Tools is negligible compared with the labor and time cost that they save. A Walton Tool readily at hand is insurance against lost time. Try them at our expense in your shop . . . and rate them for a place in your tool crib.

Write for Data

Folder No. 12



Use postpaid card. Circle No. 308

202



circulates coolant or cutting oil. Volumes of 20 gpm at 7' head, or 10 gpm at 14' are available.

Brown & Sharpe Mfg. Co., Providence, R.I.

Use postpaid card. Circle No. 102

Toolmakers' Microscope

A toolmakers' microscope which combines a range of 3" by 8", a purely optical measuring stage, and a binocular microscope tube, has been introduced by Opto-Metric Tools, Inc.

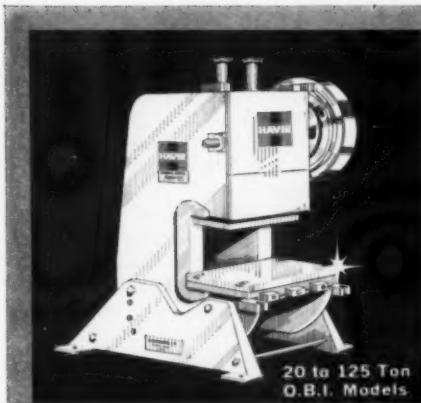
This Leitz model incorporates master scales that are read directly in .0001" through a single projection window. These scales make the measuring operation in both directions fully continuous, since no gage block dimensions have to be added or subtracted from the scale readings.

The binocular intermediate image tube retains the one-to-one relay system of the standard Leitz tube, plus a second relay ratio of five-to-one. With the same optics, two series of magnifications become available as 10x, 20x, and 30x, as well as 50x, 100x, and 150x. The tube also features one-to-one thread and radii charts internal protractor reading in 1 min., and a double-image adapter in complimentary colors for checking center distances of holes.

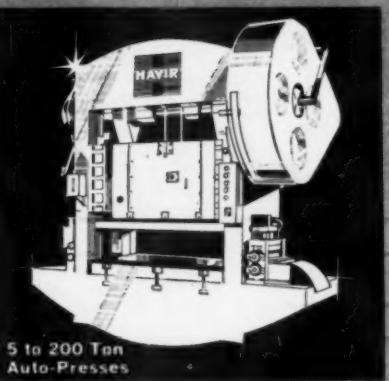
Opto-Metric Tools, Inc., 139 Varick St., New York 13, N.Y.

Use postpaid card. Circle No. 103

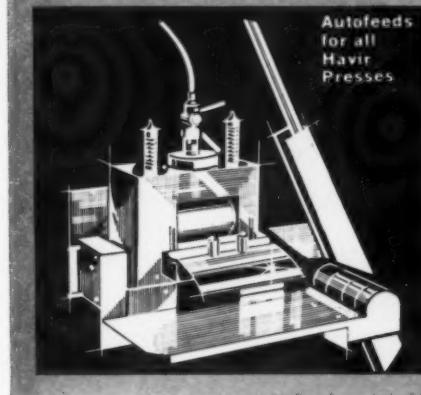
MACHINE and TOOL BLUE BOOK



20 to 125 Ton
O.B.I. Models



5 to 200 Ton
Auto-Presses



Autofeeds
for all
Havir
Presses



2 to 10 Ton
Junior O.B.I.'s

SELECTION:

Pays off in better jobs...at bigger savings

Havir's full line of automatic presses, large and small O.B.I.'s and accessory feeds let you equip your pressroom more efficiently at minimum expense.

Analysis prove that in production versus costs comparisons, Havir presses give you more for the money . . . in the short and long run.

See for yourself. 30 years a press leader. Write for free catalogs and prices today. **Havir Manufacturing Company, 438 Cleveland Avenue, St. Paul 4, Minnesota.**

Since 1929

More Punch **HAVID** *Per Press*

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• MINUTE MAN® KEYWAY BROACH KITS

• du MONT TOOL BITS • MINUTE MAN® MAGNETIC BASES



We cut

**Keyway cutting costs 75%
with a Minute Man®
KEYWAY BROACH KIT**

Before Minute Man® we had to set up big machine tools to cut keyways. No more. With the Minute Man Keyway Broach Kit, and an arbor press, we cut keyways by hand in one minute for as little as one cent a keyway. Any standard size from $\frac{1}{16}$ " to 1" in any bore from $\frac{1}{4}$ " to 3".

Special and stock square, round, hexagonal and Production Type Keyway Broaches will also save time and money. Send the coupon for complete details.

- (A) SQUARE BROACHES $\frac{1}{16}$ " to 1" square holes
 (B) HEXAGON BROACHES $\frac{1}{16}$ " to $\frac{1}{4}$ " hexagon holes
 (C) ROUND BROACHES $\frac{1}{16}$ " to 1" round holes

The duMont Corp., Greenfield, Mass.

MAIL FREE BROACH CATALOG AND PRICE LIST T describing Square, Hexagon Broaches, Production Type Keyway Broaches and Keyway Broach Kits to

Name.....

Company.....

Address.....

duMont

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• SQUARE BROACHES • ROUND BROACHES • PRODUCTION TYPE BROACHES • SPECIAL BROACHES

Optical Angle Checker

By combining a plane mirror and a miniature Ultradex indexing table, AA Gage Co. has developed a 360-sided optic-mechanical polygon for checking or calibrating angles. This instrument is accurate to $\frac{1}{4}$ sec. of arc, total accumulated error.

The base is made up of two plates, each with 360 serrations, that are separated when the operating handle is depressed. The top plate can then be moved through any angle and lowered onto the bottom plate. Regardless of what degree of angle is being checked, all 360 serrations engage. The principle allows the serrations to seat



uniformly so that the instrument maintains its accuracy through use.

In a typical setup, an autocollimator is directed to sight on a reference mirror and on the mirror of the polygon, which is clamped on the dividing head being checked. The head is rotated a specific number of degrees in one direction and the polygon mirror is rotated the same number in the opposite direction. The amount by which the polygon mirror does not return to its zero position is determined by sighting through the autocollimator and is a measure of the inaccuracy of the dividing head.

Diameter of the clamping ring is 5".

AA Gage Co., 350 Fair St., Detroit 20, Michigan.

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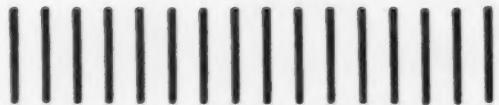
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"The Bokumatic Model B-1 tool holder and recessing cutter lets us cut 4-7/16" diameter snap ring retaining grooves in passenger car mirrors at the rate of 425 per hour as compared to the 60 we would have gotten on a lathe set-up," says M. M. Andrews, president,

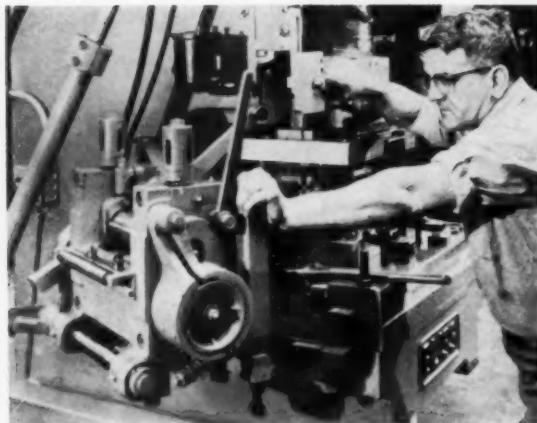
Mutual Plating and Die Casting Co., Detroit, Michigan. This is typical of the way in which the standard Bokumatic tool holder can be adapted to meet special requirements. For complete information write for a free copy of the BO-1-60 catalog.

BOKUM TOOL COMPANY, INC.



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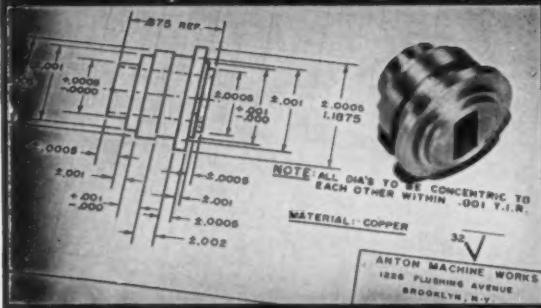
Swing-Out Feed

A swing-out portable feed which makes a press easily adaptable to either single or continuous operation is being offered by the E. W. Bliss Co. Available on new presses only, it can be used as a conventional single roll feed for

continuous feeding, or by simply removing two bolts, it can be swung away from its normal position to permit single trip hand feeding.

Further versatility is afforded by the adaptability of one feed to a number of presses of the same or different ton-

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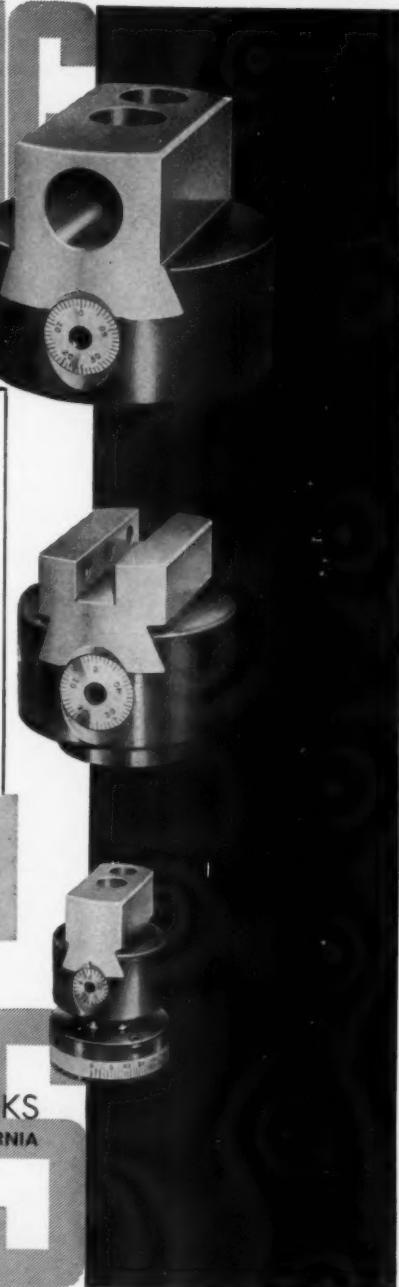
Among those available, you may select tenth-setting heads for extremely close work, square and slotted bar holder heads for special application, and a variety of hole sizes from $\frac{3}{8}$ " to $1\frac{1}{2}$ ".

Whatever your requirements, there is a Criterion Boring Head that will do your job.

Shanks and adapters for all standard machines are available at your Criterion dealer. Ask him to show you the complete line of Criterion Boring Heads, shanks, boring, grooving and threading tools.

When choosing your boring equipment look to the name that has consistently stood for the highest quality for the past 25 years.

For more information on Criterion Tool Products, write for free literature or consult the dealer in your area.



HEADS

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nages. Each press must be equipped with special mounting pads, pivot bracket, and throwblock, to permit transfer of the feed from press to press.

The feed can handle .125" stock up to 8" wide. It has a feed length of 0 to 8" and a feed height of 2" to 4½".

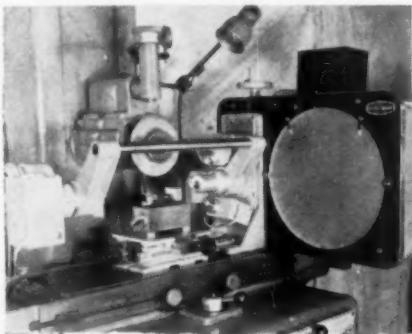
E. W. Bliss Co., Press Division, 1004 E. State St., Hastings, Mich.

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Optical Form Grinder Projector

An optical form grinder projector comparator, known as the OFG-300, has been announced by the Portman Instrument Co. This projector can be used on most standard surface grinding machines. Conventional grinder controls are used to develop shapes and forms by following the enlarged projection of the work on the screen. The projector is bolted to the tee-slots on the grinder table and can be easily

removed. It can then be used as a conventional comparator on a work bench. It is furnished complete with a



focusing work table, surface illumination attachment, graduated screen, and lens magnifications of 10x and 20x.

Portman Instrument Co., 1997 Palmer Ave., Larchmont, N.Y.

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spring pressures, 8-32 thru 5/8"-11 threads. Northwestern Tools, Inc. 119 Hollier Ave., Dayton 3, Ohio.

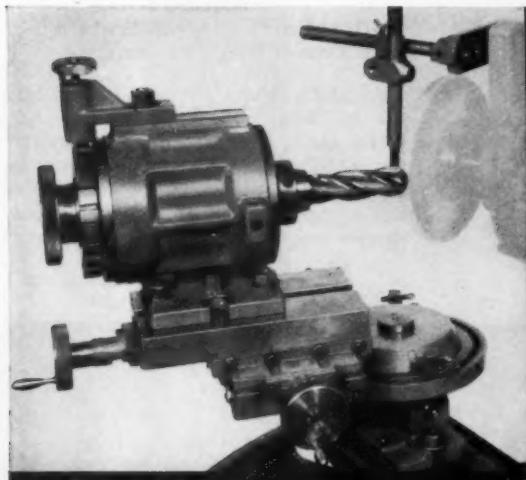


PLASTIC BALL KNOBS with brass inserts are now available in four diameters and twelve threads sizes. 3/4" diameter with 10-32 threads. 1" diameter with 1/4-20, 1/4-28, 5/16-18 or 5/16-24 threads. 1 1/8" diameter with 5/8-16, 3/8-24, 1/2-13 or 1/2-20 threads. 1 1/8" diameter with 1/2-13, 1/2-20 or 5/8-18 threads. Northwestern Tools, Inc. 119 Hollier Ave., Dayton 3, Ohio.



SWING "C" WASHERS complete with shoulder screws, are now available in four sizes for 3/8", 1/2", 5/8" or 3/4" bolt sizes. Write or call today for your free new 16-page catalog. Catalog includes tracing templates of jig and fixture components. Northwestern Tools, Inc. 119 Hollier Ave., Dayton 3, Ohio.

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Precision ball bearing workhead 6B mounted on compound Slide for setting cutter to correct position when grinding end cutting flutes and radii. Other type workheads available.

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RADIAL
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Radial Grinding Attachment D combines with Unit 1A for sharpening end mills with square, conical, or ball nose shapes.

UNIT 1A. Universal Cutter Grinding Fixture fits any universal tool or surface grinder.

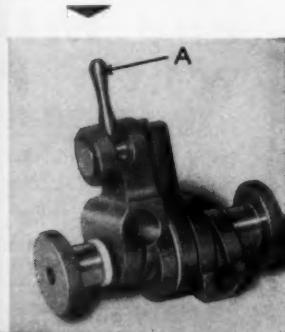


UNIT 4A. Radial Grinding Fixture for sharpening fluted end mills with square, conical, or ball-nose mills. The index disc provides for multi-flute cutters.



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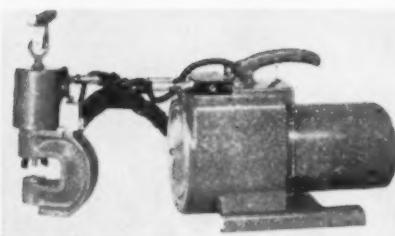


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SLIDING SWIVEL FOLDER



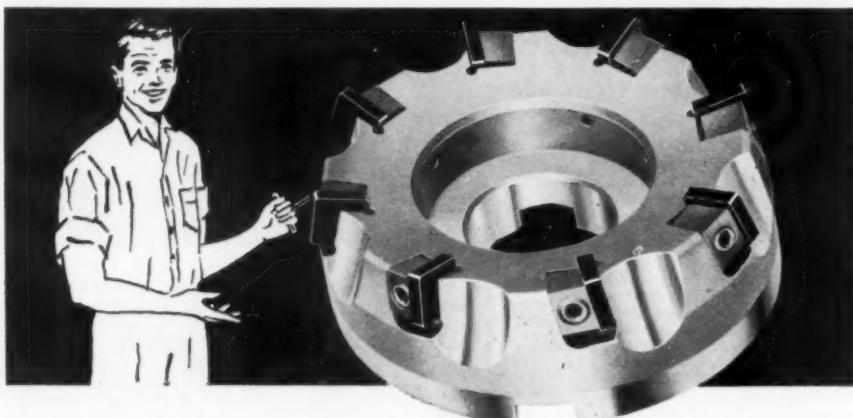
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Hydraulic Punching System Has Two-Stage Pumping

Available from W. A. Whitney Mfg. Co. is the No. 700-T- $\frac{1}{2}$ power unit which has a two-stage pumping system for rapid approach and slow down for work stroke. This design insures no loss of operating pressure during prolonged punching operations. A heavy-



just INDEX in a minute and MILL for a dollar with FUTURMILL

This six inch—eight station Futurmill (Model ZN3L) mills like a new cutter every time you index the blades. Eight brand new solid carbide cutting edges ready to go . . . in one minute . . . cost is one dollar.

Consider your costs for grinding wheels, grinding machines, labor, overhead, machine and production down time, can you grind your present cutters sharp—in one minute ??? . . . and for one dollar ???

For information or new cutter catalog no. 606 write:

Futurmill inc.

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Southfield, Michigan

(In Canada: Futurmill (Canada) Ltd. PO Box 95, Dundas, Ont.)

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DOWN TO .0016" with SPEED & ACCURACY

LEVIN® MICRO-DRILLING MACHINE

Designed for the most precise drilling of small holes. The drilling spindle, as well as the head stock spindle, revolves and thus the maximum straightness and concentricity are assured. The feed is so arranged that it does not depend on the operator's sense of feel and the smallest drills may be safely used.

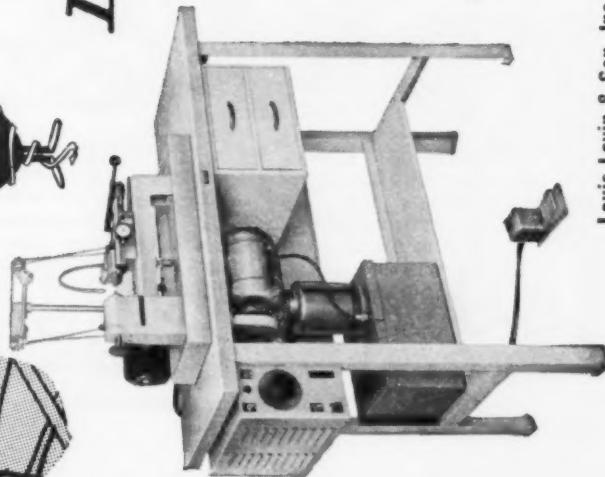


For full details of Drilling Machine and Instrument Lathes send for catalog T.

* Smallest commercial drill available.

Louis Levin & Son, Inc., 3573 Hayden Ave., Culver City, Calif.

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duty suction filter protects all pump parts.

The control valve uses a reversing motor for change of fluid flow. The motor runs only when the ram is moving.

Contactors control the motor direction with the use of pushbuttons, which can be mounted on the punch or used as a pendant station.

Low silhouette prevents tipping of

this unit which weighs approximately 59 lbs. with oil, and is only 16½" long, making it portable.

This No. 700-T-½ can be adapted for use with pressure switches, external adjustable relief valves, pilot-operated check valves, riveting guns, pinch-off tools, and positive holding of extended rams.

W. A. Whitney Co., 636 Race St., Rockford, Ill.

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Scully-Jones automatic-feed recessing tools adapt standard drill presses and radial drills to a variety of intricate recessing jobs. "Building-block" design increases work range, reduces tooling cost. Feed is automatic and continuous. Choice of interchangeable stop collars and pilot nose assemblies to pilot either in fixture bushings or in work. For work hole diameters from $\frac{3}{8}$ " to $4\frac{1}{2}$ "; depths of cut to .300".

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MICRO-PRECISION OPTICAL COMPARATOR

Yes, regardless of the size of your tool room or shop, you can have the time-saving and money-saving advantages of micro-precision optical inspection — for only \$1,075.00! It's an investment that will pay for itself many times over. Team a Covel Micro-precision Optical Comparator with a Covel Micro-Precision Grinder —you'll have a team that can't be beat for micro-precision accuracy!



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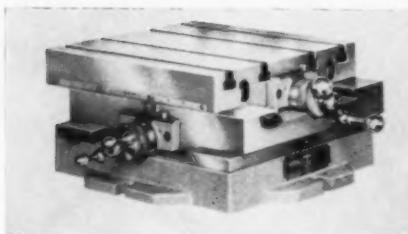
**PRECISION
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BENTON HARBOR,

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Send for complete details on the Covel Optical Comparator. Ask for Bulletin BB-101-C

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Precision Auxiliary Table

Troyke Mfg. Co. has developed a Model CS-12 cross-slide table for use in precision positioning on X and Y axis. This auxiliary table can be used in conjunction with standard rotary tables, mounting it above or below, to obtain X, Y, and rotary motion. The model shown has a 12" by 12" working surface, affords 10" of travel on

What's Your Toughest Surface Measurement Problem—

- Measuring roughness of parts that are
 - Extra-smooth? Inside small ID's?
 - Short or narrow? Remotely located?
 - Concave or convex? Of critical importance?
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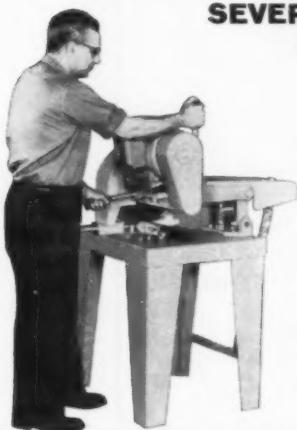
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MACHINE and TOOL BLUE BOOK



12 seconds per cut on this 2-inch steel bar!

**SEVER-ALL MODEL 1-A gives
high-quality cuts at low cost**



Even the newest super alloys can be cut at 3 to 6 seconds per square inch on the Sever-All Model 1-A dry abrasive cutting machine. The burn-free cuts above show the quality you can expect. *The Model 1-A costs approximately \$500!*

You get big capacity, too—up to 2" square solids, 3½" o.d. pipe and tubing, 3" angle iron and 4" channels. Wheel oscillation means cooler cutting, longer wheel life.

The Model 1-A is so easy to use, too. Wheel selection is simple—just two types of wheels for all Sever-All cutting jobs. Minimum set-up time required.

Immediate delivery from your Sever-All distributor. Write for his name—or for Bulletin DH-106.

SEVER-ALL ABRASIVE CUTTING MACHINES

Allison-Campbell Division • American Chain & Cable Company, Inc.

937 Connecticut Avenue, Bridgeport 2, Conn.

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each slide, and features hardened and ground feed screws mounted on tapered roller bearings and running in bronze nuts that are adjustable. Accuracy is within .001" in the full 10" of cross-slide travel.

Other features include: tapered gibbs; adjustable quick-set dials, graduated in .100" increments; gib locks on the cross-slides; and stops on each cross-slide for use with gage blocks or length gages.

All surfaces are precision ground.
Troyke Mfg. Co., 11294 Orchard St.,
Cincinnati 41, Ohio.
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Enlarged Radius Dresser

Somerset Tool Co. has announced its enlarged Model SS radius dress for use on abrasive wheels up to and including 14" in diameter. It has an accuracy of .0002".

Open and easy-to-see operation

LOCTITE Sealant

Locks
stripper bolts
tight against
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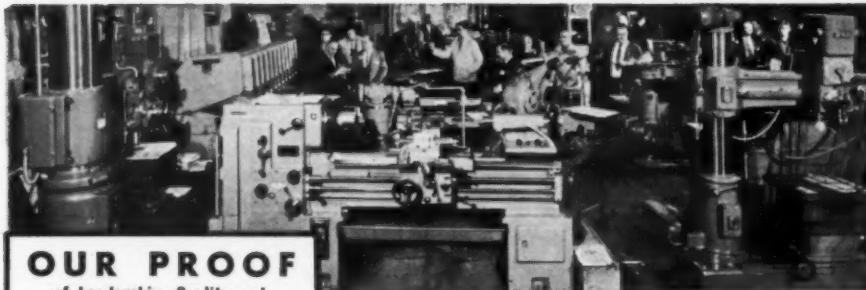
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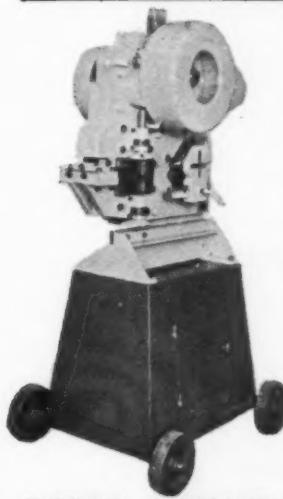
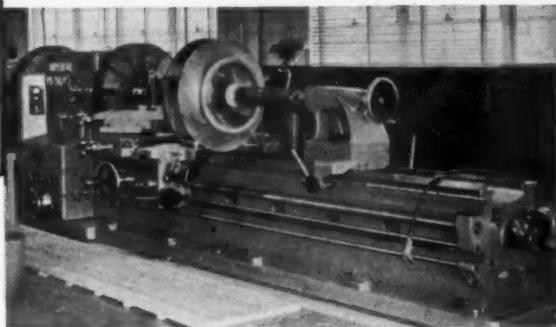
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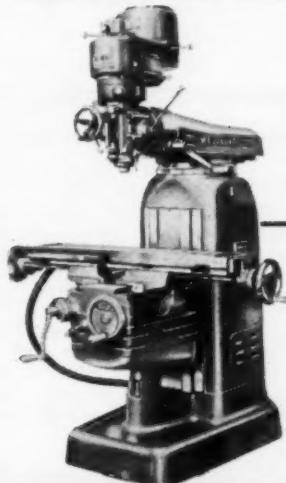
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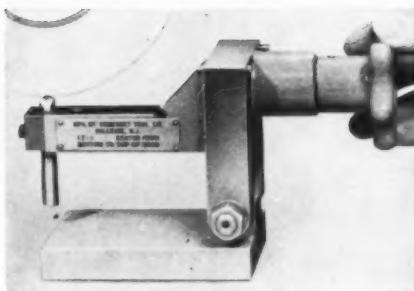
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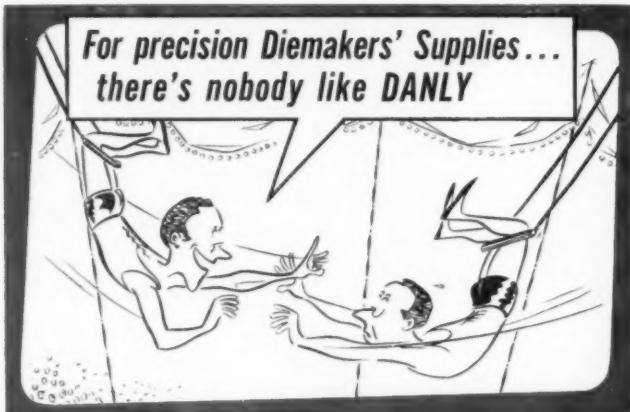


means that convex, concave, and complex combination shapes are quickly dressed.

Four stop pins allow complete adjustment from 90° through 180°. The diamond dressing point is set by measuring with a micrometer from the top of the measuring hood to the bottom of the dresser arm.

Somerset Tool Co., 220 Virginia St.,
Hillside, N.J.

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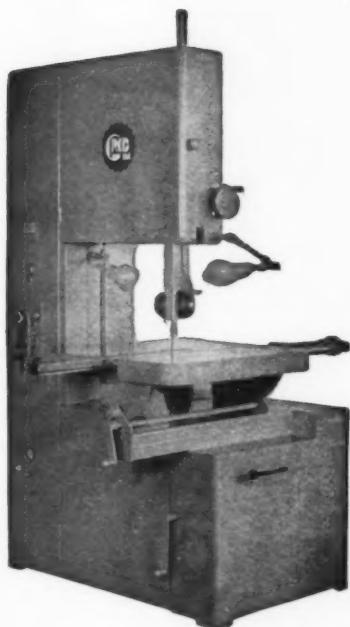
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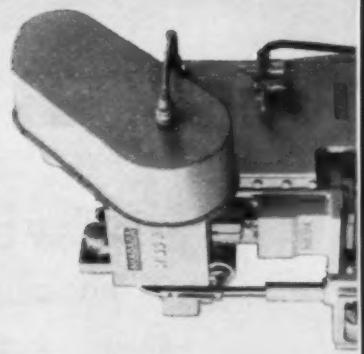


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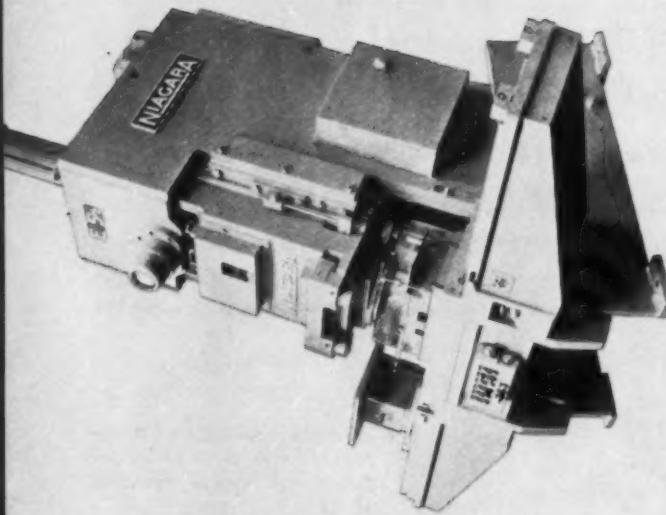
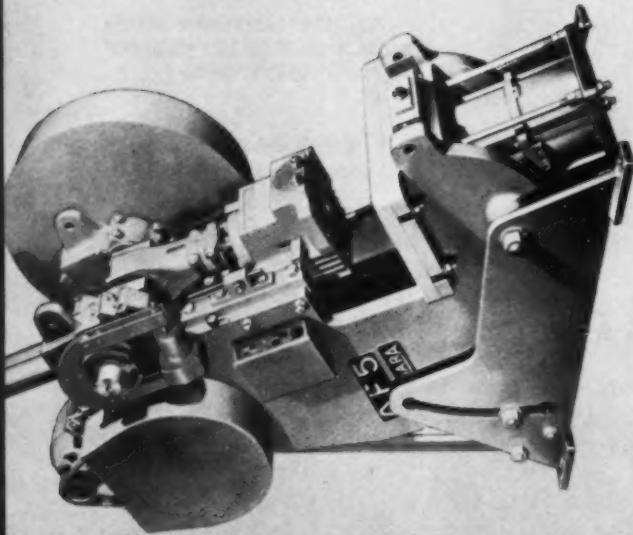
October, 1961

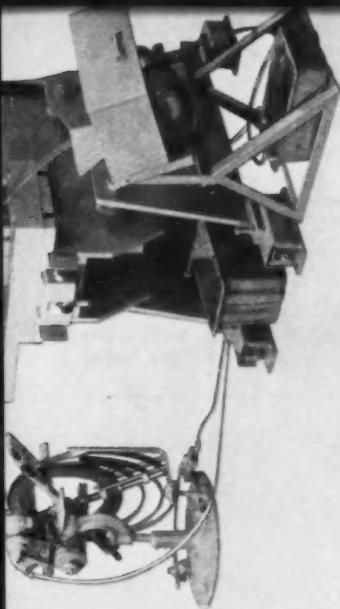
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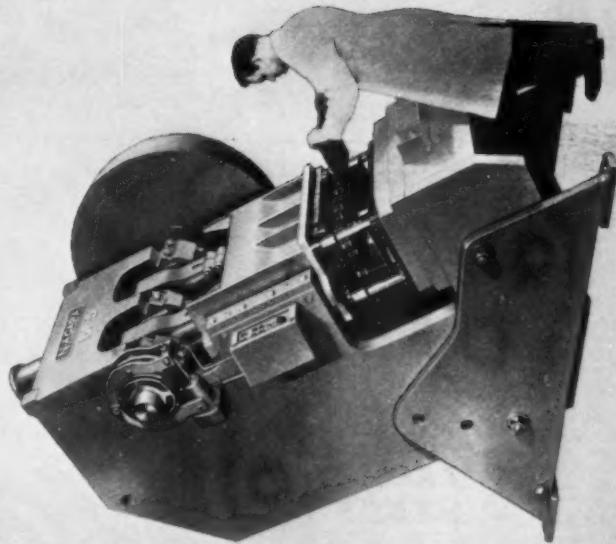
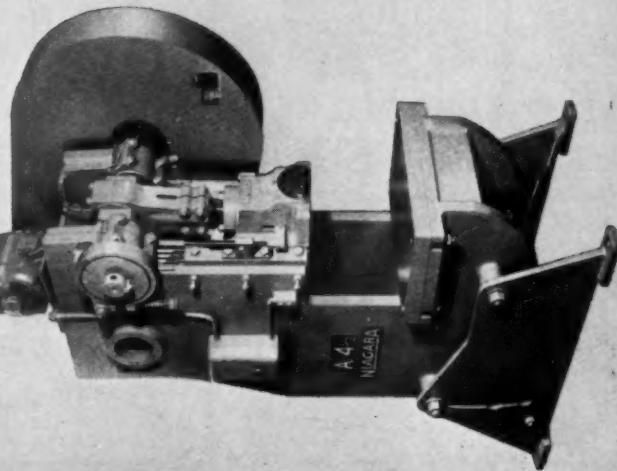


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Universal "H" Angle Plate

An improved universal angle plate, announced by Rahn Granite Surface Plate Co., is in the form of an "H" instead of the "L" or "T" designs common in iron universal angles. The plate is made of diabase.

The "H" design has a relatively large weight opposite the face to which the article is clamped. This weight helps

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Slip Spindles ON ZAGAR HEADS

for
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Spindle locations can be changed quickly, easily, on Zagar gearless heads. Rigidity is retained in a compact, low height head. Varying patterns can be economically machined with one head, adaptable to any standard drill press.

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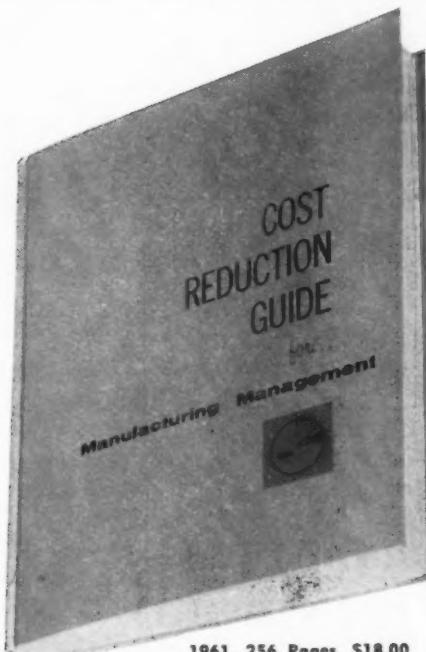
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to compensate for the article's weight and it eliminates the necessity of clamping the diabase "H" angle to a surface plate in most cases. Clamps can be placed at the bottom of the "H" section, as well as on the face.

The symmetric design insures, according to the manufacturer, uniform wear on the base as it is moved about on a surface plate. Any tendency of the angle to wear obtuse due to the weight of the article clamped to a face

is corrected when the opposite face is used.

This angle plate is made in two sizes: 6" by 6" by 6", and 6" by 9" by 6". Each is made in two grades: an inspection grade in which each of the twelve 90° angles is made to a tolerance of .000050" TIR; and a laboratory grade in which the tolerances are .000025" TIR.

Rahn Granite Surface Plate Co., 639 N. Western Ave., Dayton 7, Ohio.

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Press the button, aim the beam, read the speed . . . that's how easy and fast RPM measurement is with the new Pioneer Photo Tachometer. Ideal for use on lathes, drills, presses, drives and wheels. Operates electronically, with no wires or mechanical connections. Send for free bulletin.



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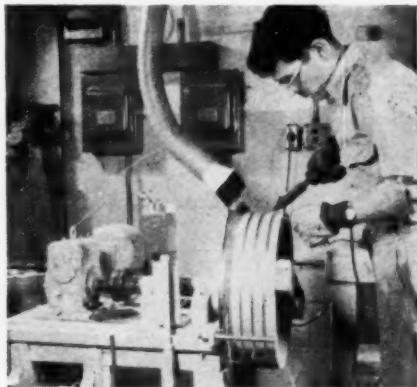
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Forest Park, Illinois



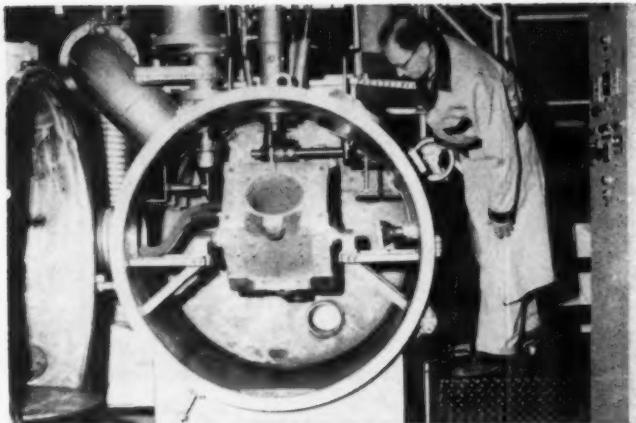
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PUT IT ON THE  **THE BLANCHARD MACHINE COMPANY**
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Induction-Heated Melting Furnace

An induction-heated melting furnace with a capacity of 50 lbs., designed for research and development of work or small-quantity production, has been announced by F. J. Stokes Corp.

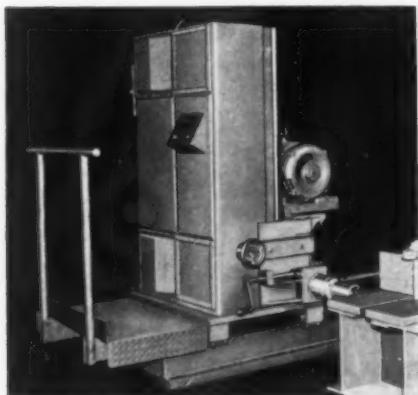
This Model 436-504 is a large-capacity alloy-additions system which contains four 36-cu. in. buckets and one 200-cu. in. bucket enclosed in a single compact chamber together with a vibrated trough and chute. The full-opening lid of this chamber is transparent to permit

continuous observation. The buckets can be emptied onto the chute in any sequence desired by external handles which are located on the upper level of the control platform.

Semi-continuous operation is facilitated by a 4" ball valve in the line connecting the additions system to the melting chamber. Cycle time has been reduced by increasing the pump-down speed of the vacuum pumping system.

F. J. Stokes Corp., 5500 Tabor Road, Philadelphia 20, Pa.

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Compact Vertical Mill

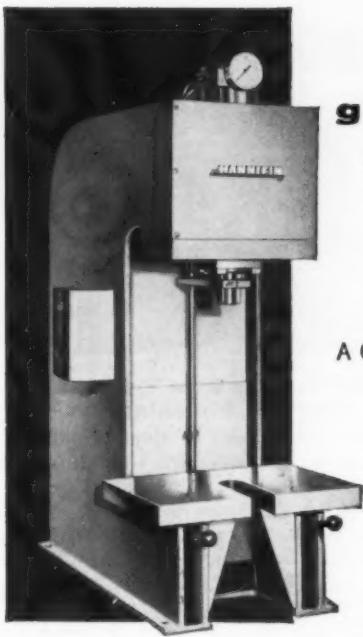
Futurmill, Inc., has introduced its Rojar milling machine, designed for milling columns, chords, beams, and other structural steel shapes.

This compact machine stands 72" high, and standard length is 96". The 15-hp. spindle provides ample power for structural milling applications and has 42" of vertical travel, 66" horizontal, and 3" micrometer hand-wheel infeed. Standard spindle speed is 1200 rpm.

All movements are controlled from convenient operator push-button panel.

Futurmill, Inc., 19720 W. Eight Mile Road, Southfield, Mich.

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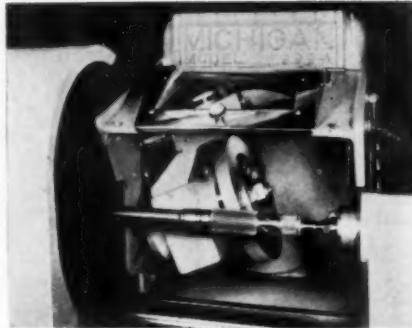
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Contour checking fixture with De-Sta-Co clamps provides a quick check of the accuracy of parts against a master template.



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Four Motions Give True Honing In Abrasive Finishing Process

A new approach to abrasive finishing for hardened gears and cylindrical parts, embodying a four-directional relative movement between the work and the tool, is announced by Michigan Tool Co. With this process, nicks and burrs can be removed with ease and some dimensional errors can be corrected.

The process has been incorporated in a new version of an abrasive gear finisher. In addition, a new head-modification kit is available to convert former models in the field.

For finishing gears, the abrasive hone used is a gear-like tool made of a special plastic impregnated with abrasive. It is rotated in tight mesh with the hardened work gear at crossed axis. The honing action is achieved by combining four motions: an in-mesh rotation under controlled load; a crossed axis relationship between hone and work; a high-speed axial oscillation of the tool in a ratio of three oscillations for every revolution of the tool; and a reciprocating motion, which traverses the work a preset amount across the hone for the gear's full face width.

PRODUCTION
DETROIT STAMPING COMPANY

Hone rotation is variable from 150 to 600 rpm and table reciprocation can be independently varied. Tool head angle is variable up to 25°. Axial movement of the hone is approximately 1/16" and is fixed at a ratio of 3 to 1 with the rpm.

For narrow gears or shoulder gears, table reciprocation can be locked out and the combination of rotation and axial oscillation will provide ample honing action.

This abrasive hard gear finisher will handle a wide variety of gears up to 12" in diameter, 5" face width, and has a maximum distance between centers of 30".

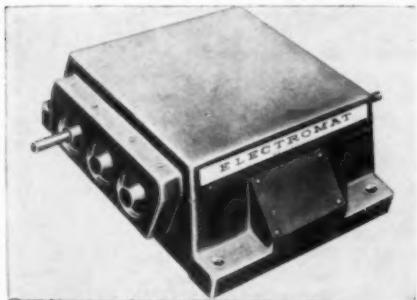
Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich.

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Electric Gear Transmission

A two-speed electric gear transmission for accurate machine positioning incorporates two electric clutches and an electric brake built into a gear transmission to provide a high-speed rapid traverse, low speed positioning, and consistently accurate stopping.

This Electromat Mark I is a geared transmission which provides remotely



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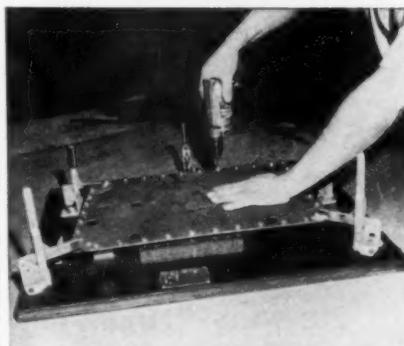
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TOGGLE CLAMPS



Simple drilling fixture made up of 5 toggle action clamps mounted on a plywood base holds drill bushing plate firmly in position.

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controlled speed selection, torque control, and braking action that can be integrated into any machine control scheme.

Speed selection is obtained through gear changes by means of electric clutches operated in oil. Remote torque control to provide smooth acceleration and shock-free stopping is achieved by means of rheostats in the clutch and brake control lines.

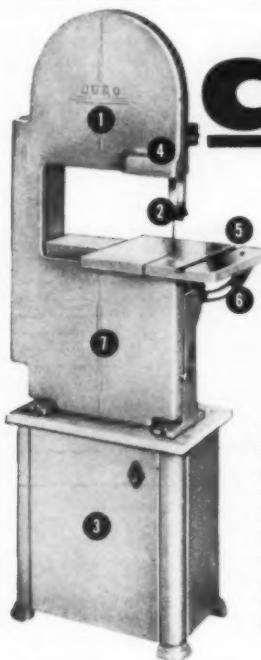
This unit is available in horsepower ranging from 1 to 40 and speed ranges from 1 to 1 and 27 to 1.

Electromatic, Inc., 4169 Pearl Road, Cleveland 9, Ohio.

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Air-Operated Diaphragm Chuck Has Interchangeable Jaws

An air-operated diaphragm chuck, designed by Erickson Tool Co., has



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The Duro 15" Production Model Band Saw is built the way you want it—designed to practical specifications—to do your kind of work! It combines the most desired qualities—accuracy, durability and a capacity to handle work efficiently, easily. There's a Duro Band Saw for every job, including 10, 12, 15 and 16" woodworking models plus metalworking units.

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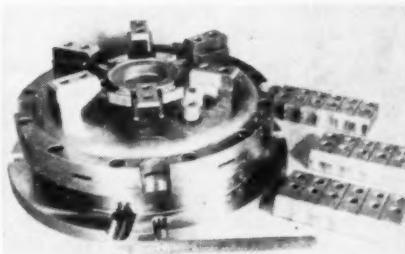
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extra short overhang and special hardened and ground interchangeable master jaws.

The workpiece is chucked and released by compressed air operating on a piston which flexes the steel diaphragm, opening the jaws the necessary few thousandths. When pressure is removed, the diaphragm flattens, closing the jaws and gripping the work. Chucks can be constructed with a double-



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acting piston for push-pull operation where additional grip is needed.

Soft interchangeable jaws, adapting the chuck to a wide range of work sizes, are machined in place. The chuck shown employs one of two available styles of special master jaws.

These chucks for internal or external chucking are made in 5½" diameter, three-jaw; 7" diameter, four-jaw; and

10" diameter, six-jaw models.

Erickson Tool Co., 34350 Solon Road, Solon, Ohio.

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Industrial Hand Grinder

Dremel Mfg. Co. has announced a hand grinder that develops 27,000 rpm and sustains its torque under load. It was designed to cover a wide range of industrial applications including polish-



CHECK ID's FROM 0.125" to 12"...

New *Sheffield Model N-8 Internalchek*, with frictionless Electrojet gaging cartridge, has 40% lighter gaging pressure. Checks size, taper, bellmouth, out-of-round. Three interchangeable pairs of gaging arms with ranges 0.125 to 0.250; 0.240 to 12"; 0.370 to 12". Depths: ½", 1", and 1½". Dual range Accutron® instrument has 10M and 20M amplifications. Write for bulletin IN-157.

The SHEFFIELD Corporation • Dayton 1, Ohio

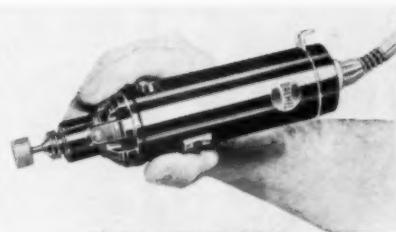
A subsidiary of The Bendix Corporation

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ing and grinding dies and molds, model shop work, production deburring, and general tool and die room use.

The motor is housed in shockproof bakelite and is equipped with a three-wire ground cord. With a collet capacity of 1/16", 3/32", and 1/8", it accommodates all standard wheels and burrs. It weighs only 18 oz.

Dremel Mfg. Co., Racine, Wis.

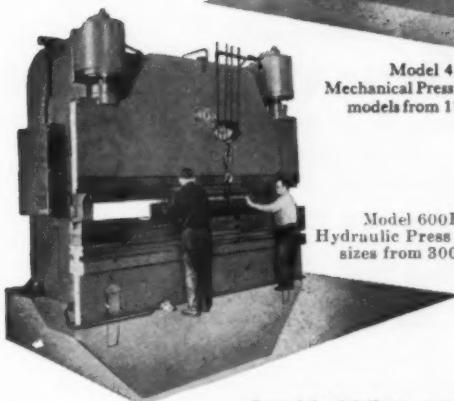


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Model 410D, 90-Ton CHICAGO Mechanical Press Brake. Other standard models from 11 to 450 ton capacities.

Model 600H10, 600-Ton CHICAGO Hydraulic Press Brake. Other standard sizes from 300 to 2000 ton capacities.

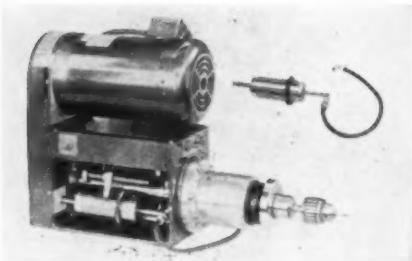
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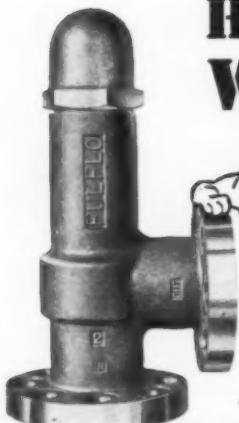


Drill and Tap Control

A control accessory that permits users to drill and tap automatically in one operation with combination tools has been introduced by The Dumore Co. It can be attached to the Dumore Series 28 Drill-N-Tap portable drilling units.

During the drilling portion of the stroke, the control is idle to provide maximum allowable thrust for rapid

HYDRAULIC WATCHDOG



**POSITIVE
AUTOMATIC
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Screw or flange types—to 600 lbs.—for pipe sizes to 3"—steel, cast iron or brass bodies—brass, steel or stainless trim.

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Engineered to your most exacting requirements, for any application, designed to do your particular job to perfection.

Write for Data Book with complete specification and engineering data.

THE FULFLO SPECIALTIES COMPANY, INC. • 417 Fancy Avenue • Blanchester, Ohio

Whatever your requirement . . . for O.E.M. use or replacement service, there's a dependable FULFLO Oil By-Pass Relief Valve designed just right, built right and priced right, too!



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MACHINE and TOOL BLUE BOOK

metal removal. As the threaded section of the tool engages the work, the control cancels out a predetermined portion of the advance pressure, producing a light tapping thrust that allows the tool to feed itself into the work.

Two models are available: one for single-tool use, and the other for multiple-spindle attachment.

The Dumore Co., 1300 17th St., Racine, Wisconsin.

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**UNIFORM TEMPERATURE
... PRECISE CONTROL**
Get both with COOLEY
a complete line of heat treating
FURNACES and OVENS

Cooley's exclusive Thermoshell heating units assure rapid heating, better heat distribution. Thermoshell coils are permanently embedded in special ceramic material that resists corrosion, fights oxidation, insures longer coil life. Readily available from stock, Thermoshell units can be replaced in minutes without dismantling furnace. For over 28 years highest quality electric furnaces and ovens for hardening, tempering, annealing, drawing, drying, baking and enameling have come from Cooley. A wide range of standard sizes is available.

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COOLEY

COOLEY ELECTRIC MFG. CORP.

36 S. Shelby Street • Indianapolis 7, Indiana

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October, 1961

Grinders With Governors

Small-wheel grinders with governors, for developing maximum power at controlled speed on tough grinding jobs, have been added to the line of portable pneumatic tools made by Thomas C. Wilson, Inc.

Series 921 is available in spindle and collet-chuck models with lever or push-button throttles and governed speeds of 12,000 15,000 and 18,000 rpm. For



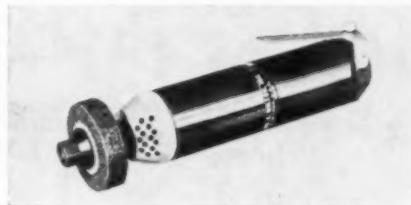
MODEL
U-75 SM

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- ✓ BENCH TYPE FURNACES
- ✓ HIGH SPEED ELECTRIC FURNACES
- ✓ ELECTRIC RECIRCULATING OVENS
- ✓ INDUSTRIAL BOX FURNACES

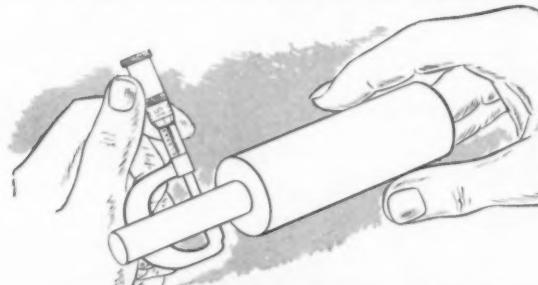
burring, die grinding, contouring, flash removal, snagging, and similar operations, both models are available with a wide variety of adapters to accommodate small grinding wheels, rotary files, carbide burs, and sanding and cutting discs.

Thomas C. Wilson, Inc., 21-11 44th Ave., Long Island City 1, N.Y.



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For More Accurate Machining



USE FISKE'S DARL BASE OIL

FISKE'S DARL BASE OIL can be used straight or reduced with mineral oil to exactly suit the work, the tool and the metal. Non-corrosive, works both ferrous and non-ferrous metals. Does not hide the work. Has excellent anti-weld value, lubricity and film strength. An exceptionally effective oil for drawing and stamping, as well as for machining.

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LUBRICANTS

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Plants: Newark 5, N.J. Toledo 5, Ohio

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collets, pushers, details

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Allen's Burn Style TAPER LOCK PUSHERS

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We Will Duplicate COLLETS, COLLET TUBES,
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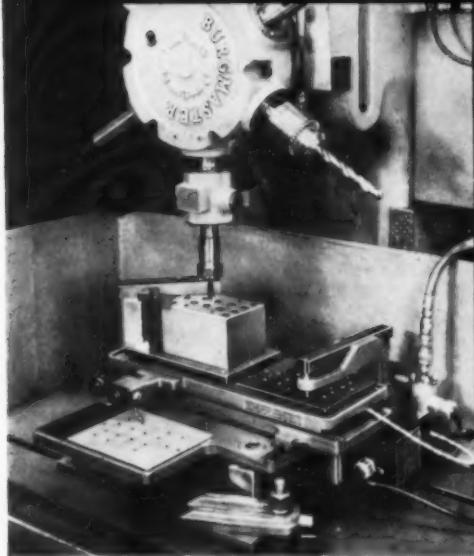
Collet Tubes and Pusher Tubes

ALLEN COLLET MFG. CO., INC.

17720 CLARANN AVE. • MELVINDALE, MICHIGAN

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MODERNAIR USES BURGMMASTER TURRET DRILL AND RAPID POSITIONING TABLE To Save 60% Tooling Costs!



Reduce tooling time by over 80%

Save 8 hours per part production time

RAPID POSITIONING TABLE Speeds 85 Drill, Tap and Ream Operations Per Part

When Modernair Corporation, San Leandro, California had to machine 85 different operations in a lot of 2024 aluminum valve bodies, they selected a Burgmaster Model 2B, 6-spindle turret drill equipped with a Burgmaster rapid positioning table. This Burgmaster combination permitted holding-fixture costs to be cut from \$266

to \$90.00, tooling time from 2 weeks to 2 days, and production time savings of 8 hours of labor per valve body. Ream tolerances were held to a $\pm .0005$ with a RMS-18 finish and hole locations were held to a $\pm .002$. Another reason you should get the facts on Burgmaster.

SEND FOR LITERATURE

Burgmaster
CORPORATION

SMALL TOOL DIVISION

15001 S. Figueroa Street, Box 311

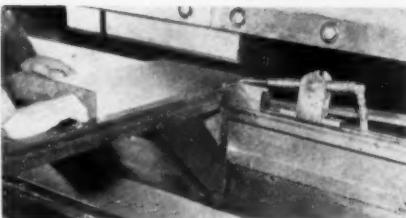
Gardena, California, Phone FAcully 1-3510



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Air Finger Positioning Device

An alignment device, called an air finger positioning gage, has been developed by the Chrom-O-Lite Co. for use on press brakes. It handles all back alignment problems in bending sheet metal, and is actuated by a pedal. When pressure is applied to the pedal, the air is released into the hose and then into the gage. Pressure activates the



Now, with more than fifty models in the Dustkop line—plus efficient accessory items—the odds are that a standard unit will solve your problem. Dustkop units solve other problems too. They're easier to install, save space and money and are virtually maintenance-free!

how to select a dust collector

This new brochure includes all basic information needed to select the right dust or mist collector for grinding, buffing, polishing and other types of service. Write for your copy. No obligation.



AGET
Manufacturing Company
1402 Church St., Adrian, Michigan



DUSTKOP STOPS DUST

Use postpaid card. Circle No. 341

finger which moves out, indicating the correct placement of stock on the press brake. The movement of the finger can be adjusted to pinpoint accuracy.

The bar on this positioner fits all standard brakes. It remains locked in position during operation.

The Chrom-O-Lite Co., 2701 E. 78th St., Minneapolis, Minn.

Use postpaid card. Circle No. 119

Electronic Micrometer System Has Automatic Recording

An electronic micrometer precision measuring system displays measurements to ten millionths on a five-digit counter and automatically plots the values on a chart recorder. Readings are taken on a 1 min. or any pre-selected time cycle.

Micrometer head is temperature



A NEW ERA IN NAME PLATE MARKING

Just a touch of the finger delivers up to 2 TONS pressure for deep, legible impressions on metal or plastic tags. Standard electric typewriter keyboard — over 100 characters a minute. A modern marvel!

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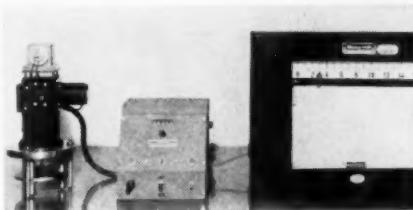
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MACHINE and TOOL BLUE BOOK

compensated. Head, control unit, and recorder can be remotely located from each other.

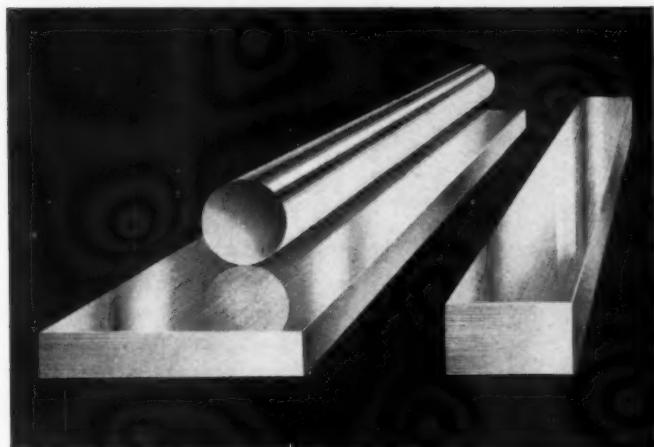
This system is suited for automatic recording of small displacements over a long period of time. Typical use includes dilatometer measurements of material expansions at elevated temperatures.

J. W. Dice Co., Englewood, N.J.



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PRECISION GROUND IN THE SIZES YOU USE



Colonial No. 6 FLATS / SQUARES / DRILL ROD

First Quality oil hardening die steel, ready for design layout in over 700 sizes of flats and squares, 295 sizes of drill rod—in stock almost everywhere! Colonial No. 6 combines high toughness and wear resistance, is non-shrinking, easy to machine, completely free from decarb, and hardens in oil from low temperature. Write for Data Sheet!

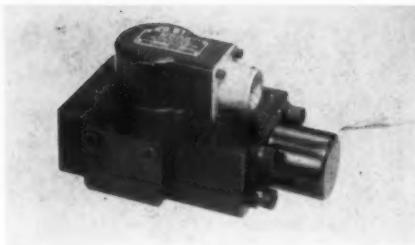


Vanadium-Alloys Steel Company
LATROBE, PENNSYLVANIA

Use postpaid card. Circle No. 343

October, 1961

241

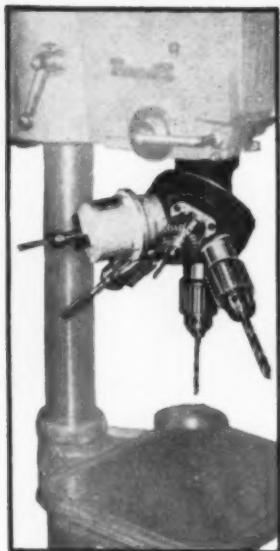


Servo Valve's Design Overcomes All Contamination Problems

Moog Servocontrols, Inc. has introduced its Series 73 industrial servovalves with flow ratings of 1, 2½, 5, 10, and 15 gal. per minute at 1000 psi pressure drop and maximum signal.

These servovalves have three features to overcome the problem of oil contamination: high spool positioning force,

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DRILL, REAM, TAP,
COUNTERSINK AND
COUNTERBORE ON A
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CONVERT YOUR STANDARD
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SION TURRET DRILLING MA-
CHINES—one quadrill mounted on
your drill press will . . .

- Save you up to 70% in direct labor costs over in-line, single gang drill setups.
- Save you up to 350% in capital investment costs (other turret machines cost several hundred to thousands of dollars more).
- Do the work of 4 or 5 single drill presses—all work done at single hole location (increase production 50%, cut rejects, save floor space). Ideal for both long and short runs . . . fast setups . . . simple tooling.

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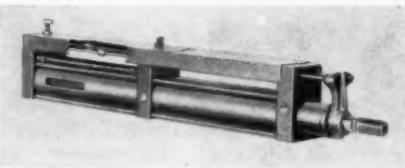
CHICAGO QUADRILL
Company

1846 BUSSE HIGHWAY DES PLAINES, ILLINOIS
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provided through the use of internal mechanical feedback; a large pilot-stage filter which can be replaced in the field; and an optional separate pilot supply port to enable the use of a second oil supply which can be at a higher pressure and subject to more filtration than the second stage supply.

Moog Servocontrols, Inc., P.O. Box 9,
East Aurora, N.Y.

Use postpaid card. Circle No. 121



Air-Hydraulic Actuator

An improved air-hydraulic actuator has been introduced by The Electro-

TORIT DUST COLLECTORS

keep plants clean lessen employee grievances
save valuable dusts

Torit Dust Collectors keep plants clean . . . an important factor in protecting employee health and morale—and in lowering absenteeism and employee grievances. Economical, too, these units are portable. They cost a fraction of central built-ins and are not limited to certain areas. They save heat by re-circulating clean, filtered air. And, as in tungsten carbide manufacturing or diamond grinding operations, they pay for themselves in days with the valuable dusts they recover.

Torit Cabinet Cloth-Filter Model. High efficiency collection of all types of dust. Particles are trapped on fine-woven cloth filters—99%+ efficiency (by weight). Clean filtered air is drawn past the motor and blower to keep it cool.

Self contained, portable steel cabinets. Removable doors allow ready access to filters, motors, and blowers. Filters are chemically treated for spark resistance and sealed against leakage. These compact units give maximum filter area in smallest possible space. Capacities range up to 2100 cubic feet per minute. Larger units are built on special order. Prices start at \$230.

*For a FREE handbook detailing specifications and performance data of Torit Dust Collectors and applications, write Dept. 629

TORIT MANUFACTURING CO.

1133 Rankin Street • St. Paul 16, Minnesota

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Mechano Co. Because of its in-line construction, it provides smooth linear motion from air pressure. Previously, the controlled traverse was in the outward direction only. Now the unit is available with control inward, outward, or in both directions. The actuator can also be provided for nose-mounting and clevis-mounting.

The Electro-Mechano Co., 241 E. Erie St., Milwaukee, Wis.

Use postpaid card. Circle No. 122

Floating Caliper Fixture

Remote indication, recording, or automatic control of thickness of steel, plate glass, fiber board, or similar strip materials is accomplished with the Model 130 floating caliper fixture, made by Daytronic Corp.

The floating design allows independent movement of both gaging rollers to insure firm contact with both surfaces of the material at all times.

**ELIMINATE
WEAR ON YOUR
COSTLY DIE SETS**
**WITH INEXPENSIVE
ACRO
LEADER PIN OILERS**



Pin oilers in place on die set.

These simple, inexpensive pin oilers fit over each leader pin and seal in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and upward stroke distributes oil evenly over leader pins. You'll eliminate bushing wear, leader pin scoring, and maintain die accuracy with these oilers.

Order today. Prices shown are F.O.B. Milwaukee.

Pin dia. $\frac{1}{8}$ ", 1" or $1\frac{1}{8}$ ".....	Pr. \$ 6.50
Pin dia. $1\frac{1}{4}$ ", $1\frac{1}{2}$ " or $1\frac{3}{4}$ ".....	Pr. 8.00
Pin dia. 2".....	Pr. 10.00
Pin dia. $2\frac{1}{4}$ ".....	Pr. 12.00
Pin dia. 3".....	Pr. 14.00

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ACRO METAL STAMPING COMPANY

330B E. Reservoir Ave., Milwaukee, Wis.

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Nominal thicknesses up to 1" can be measured with an accuracy of .001". A deep throat allows measurements to be taken in from the edge of the strip where desired. Work is contacted by precision ball-bearing wheels with only such force as is necessary to maintain firm contact.

The device incorporates a differential transformer transducer which transmits measured values to a variety

of available instrumentation items for the desired type of read-out function.

Daytronic Corp., 225 S. Jefferson St., Dayton 2, Ohio.

Use postpaid card. Circle No. 123

Hole Punching Units

Tool Products Corp. has announced a series of regular-duty 5½" hole punching units which increases the range of

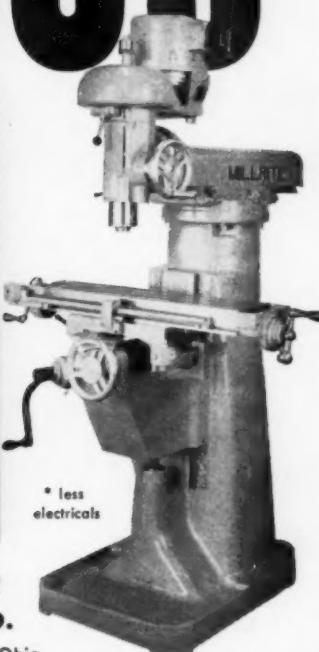
\$990*

BUYS FULL-SIZE
¾" Collet Capacity
**RAM & TURRET
VERTICAL MILL**

Mass production by Cincinnati craftsmen permits the precision built Millrite® to sell for this low, low price. It's engineered with numerous exclusive features to add to ease of operation, rigidity, and lasting low maintenance costs. Write for NEW folder giving full details of this amazing machine tool value.

U•S•Burke
MACHINE TOOL CO.

1 Brotherton Rd. Cincinnati 27, Ohio
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hole punched up to a maximum of 3½" diameter. The 5½" designation is the width of the holder or C frame.

This series complements TPC's regular-duty units which provide hole diameters up to 2" and perforate a maximum metal thickness of $\frac{1}{8}$ " in mild steel.

The holder is a semi-steel casting

specially cored for lightness and ease of handling.

The units are available with 8", 12", and 16" throat depths, and are interchangeable or compatible with other makes of unitized tooling. Punches are easily removable from the top, and die buttons can be removed from the front.

Tool Products Corp., North Tonawanda, New York.

Use postpaid card. Circle No. 124

CONSTANT SPEED UNDER LOAD
FROM 7,200 RPM TO 60,000 RPM!

2 HP 1/2 HP 1/4 HP 1 HP

Precise.

NEW SUPER CYCLE POWER QUILLS

Extend your range of precision grinding, milling and finishing—step into high production with the new line of Precise Super Cycle Power Quills. These new units provide constant speed operation with no speed drop under load . . . run at speeds from 7,200 rpm to 60,000 rpm . . . assure excellent surface finishes, longer life for abrasive wheels and carbide midget mills. Rotor has no windings, no commutator — never needs servicing. Super Cycle Power Quills (with converters) are available in four basic models — provide up to 2 hp output at the chuck. All Super Cycle Quills are interchangeable with Precise Universal Motor Power Quills.

CONVERTERS—Self-contained, portable converters for Super Cycle System. Single, four-speed and continuously variable models.

Grinder-Millers, Power Quills, Jig Grinders,
Milling Machines, Automatic Drill Units,
Cutting Tools, Vapor-Lub Cooling,
Sklero Hardness Tester
Quality and Precision Since 1882

Precise

PRECISE PRODUCTS CORPORATION
3731 Blue River Road, Racine, Wisconsin, U. S. A.
Branch Plant: Precise, G. m. b. H., Duesseldorf, Germany

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Hydraulic Power Packages

A line of hydraulic power packages, available in tank sizes of 10, 20, 40, and 80 gal., has been announced by Vickers Inc., Division of Sperry Rand Corporation.

Each package includes an electric motor (sizes to 40 hp), a choice of piston and vane pumps (sizes to 60 gpm), a relief valve, and a reservoir. Internal baffling provides a long return

path which improves heat dissipation and purges the oil of any trapped air.

A second air breather is provided to prevent blow-back when filling.

Other features include single-bolt clean-cut cover for easy accessibility, a shaft coupling guard, and a magnetic drain plug.

Vickers Inc., Division of Sperry Rand Corp., Detroit 32, Mich.

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FOR SALE!

ONE 2" BORE x 4" STROKE
DOUBLE ACTING CYLINDER

List Price \$2770

- BRAND NEW!
- NEVER USED!
- PACKED IN ORIGINAL CARTON!



- Ground & Polished St. St. Rod.
- Nylined Bearing.
- Honed Brass Barrel Copper-brited for resistance to corrosion.

Parts drawing will be furnished at no charge. We don't anticipate that Replacement Parts will be required . . . but if some ever are, the parts will be available from stock.

For 150,000 other such
bargains write for
CATALOG NO. 90



ALLEN AIR CORP. 255 EAST 2nd ST., MINEOLA, N. Y.

MTB-10

Name.....

Company.....

Address.....

City..... Zone..... State.....

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Air-Powered Transfer Pump

An air-powered transfer pump, made by the Aro Equipment Corp., is designed to eliminate time-consuming hand pumping of fluids from drums to other containers or points of use. It will pump up to 7 gal. per minute free flow, and handles fluids up to 90-weight gear oil.

The manufacturer states that this "Little Squirt" will transfer almost any kind of non-corrosive fluids, including oils, gear oils, water, kerosene, gasoline, anti-freeze, thinners and solvents. Delivery is adjustable from zero to full flow. It requires as little as 15 psi, or, on standard line pressures, up to 150 psi.

MILL

KEYSEATS OIL GROOVES

QUICKLY — INEXPENSIVELY
IN METALS OR EITHER
SOLID OR LAMINATED PLASTICS.

NATIONAL KEYSEATING OR OIL GROOVING MILLERS—when chucked in a drill press or radial, mill accurate keyways, oil grooves or slots in one pass of the miller through the bore of work piece.

NATIONAL millers are also designed for milling in BLIND holes. They can be indexed for milling opposite or multiple splines.

NATIONAL millers are available in stock sizes for bores from $\frac{1}{2}$ " to $3\frac{1}{2}$ " in diameter and with cutter widths from $3/32$ " to 1". Eccentric bushings are available to increase the operating range of each miller.

Keyseating or Oilgrooving Millers
built to your special requirements.

WRITE FOR FREE BROCHURE.

NATIONAL MACHINE TOOL COMPANY
P.O. Box 25122
CINCINNATI 25, OHIO, U.S.A.



Use postpaid card. Circle No. 350

All aluminum parts are anodized, and steel parts are heavily phosphate coated for protection against corrosion and abrasion. A universal bung mount allows fitting to either standard $\frac{3}{4}$ ", $1\frac{1}{4}$ ", or with adapter, 2" inlet.

Aro Equipment Corp., Industrial Division, Bryan, Ohio.

Use postpaid card. Circle No. 126

Tape-Controlled Drill For Circuit Boards

A machine designed to drill printed circuit boards of a wide variety of materials and thicknesses, has been introduced by Edlund Machinery Co. It is tape-controlled, consisting of a point-positioning table and four drilling clusters, each with four independent

One of these Wilson "Rockwell" instruments will do your hardness testing job

No matter what your hardness testing requirements are, there's a Wilson "Rockwell" tester to do the job. Choose from this complete selection of hardness testing equipment:

"Rockwell" Hardness Tester—for most hardness testing functions.

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TwinTester—Combines functions of "Rockwell" and "Rockwell" Superficial testers.

Semi and Fully Automatic—for high-speed testing, at rates up to 1,000 pieces per hour. Automatically classifies pieces as CORRECT, TOO HARD, or TOO SOFT.

Special Machines—for testing large objects, internal readings, and other unusual applications.

Diamond "Brake" Penetrators—Flawless diamonds, individually calibrated, and highest quality construction assure perfect testing every time.



Write for
Bulletin RT-60

WILSON "ROCKWELL" HARDNESS TESTERS

See us in
Booth 952
National
Metal
Show—
Detroit

Wilson Mechanical Instrument Division
American Chain & Cable Company, Inc.
230-T Park Avenue, New York 17, New York



October, 1961

Use postpaid card. Circle No. 351

air feed drill units which can rotate up to 22,000 rpm.

The table has a travel of 14" by 20" at 200 ipm, and a flat working surface of 18" by 44". It is built with a 2" zero offset in each axis, allowing the table movement needed for changing to different drill sizes. A backlash settling device is included to provide rapid table positioning.

The machine was designed for use with a G.E. Mark II numerical positioning control.

Edlund Machinery Co., Dept. P-CB,
Cortland, N.Y.

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Electrolytic Machining Unit

An Anocut power supply unit with a capacity of 10,000 amps is said to



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CARBIDE End Mills
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High Speed End Mills
on most jobs!

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- MORE PRODUCTION
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Your SPECIAL Carbide End Mill requirements are solicited.

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HAND DEBURRING CUTTERS 	DISC CUTTERS 	DRILL COUNTERSINKS 	SPECIAL CUTTERS 
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REGRINDING SERVICE 			

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250

MACHINE and TOOL BLUE BOOK

pack enough punch to dissolve 60 cu. in. of metal per hour in electrolytic cavity sinking or grinding operations. The full current can be concentrated in a working area of less than 3½ sq. in. to afford a penetration rate of .3 ipm.

An electronic voltage computer automatically monitors and adjusts voltage to maintain top removal speed without producing damaging sparks. At the same time, it filters out unwanted

voltage fluctuations so that smooth finishes can be maintained.

Anocut Engineering Co., 631 W. Washington Blvd., Chicago 6, Ill.

Use postpaid card. Circle No. 128

Dial Indicators

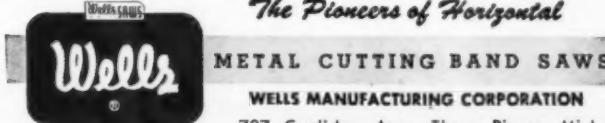
Two dial indicators, introduced by The L. S. Starrett Co., have an A.G.D.



THE WELLS MODEL 58-B

Here's a compact, convertible band saw that provides the capacity you've been looking for . . . at a modest price. Equipped with optional wheel handle unit, the Model 58-B becomes completely mobile . . . easily rolls from job to job. Use the 58-B as a horizontal cut-off machine (capacity: 6" x 10") or swing the head to upright position, install work table and it's a utility vertical band saw. See your Wells Distributor or write for Bulletin 262.

The Pioneers of Horizontal



Use postpaid card. Circle No. 353

accuracy of .00005" for the .015" total range.

Model 25-109 is a balanced dial indicator with a range of 0-3-0 and one revolution at .006". Model 25-209 is a continuous dial type with a reading of 0-6 and one revolution at .006". Both indicators are furnished with jeweled bearings.

The L. S. Starrett Co., Athol, Mass.
Use postpaid card. Circle No. 129

Slitter Knife Grinder

A slitter knife grinder for extra high production, has been developed by Hanchett Mfg. Co.

Known as the SK-24 High Power, this grinder utilizes a 12" wheel mounted on a precision spindle. It's 3-hp motor is fully balanced.

Down-feed, cross-feed, and oscillation of the grinding head are each

Could an
E-X-P-A-N-D-I-N-G PLUG GAGE
solve a gaging problem for you?

The Comtorplug expansion principle is unique . . . and proven. Hundreds of U. S. precision-production programs use it, including several of the very largest. The unique expansion plug gives true 2-point gaging. You see actual diameter in a fixed reading to fraction of .0001". You measure front or back taper exactly, also ovality, bell mouth, etc. Centering, alignment and pressure are automatic, allowing accurate use by all types of personnel.



For holes
1/8" to
10" dia.



"We've reduced
rejects since
using
Comtorplug"

If you produce precision holes in volume
SEND FOR BULLETIN 51

COMTOR COMPANY, 62 FARWELL ST., WALTHAM 54, MASS.

COMTORPLUG



Use postpaid card. Circle No. 354

MACHINE and TOOL BLUE BOOK

equipped with motor drive. Controls are fully automatic.

Hanchett Mfg. Co., Big Rapids, Mich.

Use postpaid card. Circle No. 130

Solid Carbide Drills

A line of solid carbide drills designed primarily for use in stack drilling printed circuit boards has been introduced by Ace Drill Corp. Called

the Series 362-N, these drills feature a 118° to 120° included point angle with primary and secondary lip relief angles of 6° to 7° and 30° to 40°, respectively.

They are available in standard wire sizes ranging from No. 1 through No. 72; and also in fractional sizes from $\frac{1}{4}$ " down to $\frac{1}{32}$ ", in steps of $\frac{1}{64}$ ".

Ace Drill Corp., Adrian, Mich.

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**Vital
Production
Tools
Warrant**

SENTRY HARDENING

Correctly hardened tools are essential to high production. This is where Sentry Furnaces with the neutral Diamond Block Atmosphere fulfill their greatest need, offering reliable hardening without expensive supervision, and at low, low investment and operating cost.

Your high speed tools achieve maximum hardness without risk of scale or decarburization, maintain sharp cutting edges longer, step up production.

For free demonstration hardening bring your tools to Booth 930 at the Detroit Metal Show.

Sentry
TRADEMARK

**ELECTRIC
FURNACES**

242-1

Request Catalog 4P • Write THE SENTRY CO., FOXBORO, MASS.

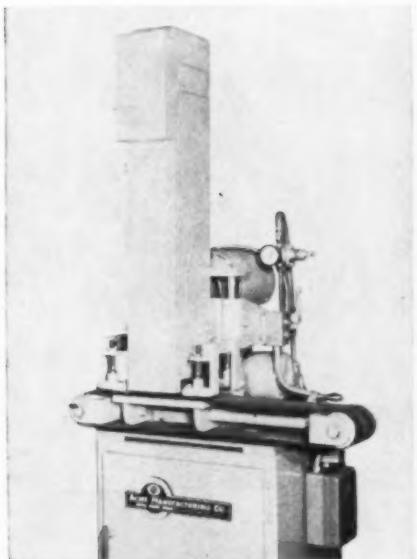
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5 WAYS....

Automatic Finishing Machine

A Model JC abrasive belt finishing machine has been introduced by Acme Mfg. Co. This machine performs flat grinding, deburring, and polishing operations on such parts as bars, strips, blanks, stampings, forgings, die castings, and sand castings. Plastic, ceramic, wood, and rubber parts can also be finished on this compact machine.

It has a motorized conveyor belt that carries the work under spring-loaded



hold-down rollers and the abrasive belt contact wheel. Multiple head assemblies can be mounted in tandem along one long conveyor belt to perform high-production progressive finishing operations. These heads can also be mounted on a bench or used in conjunction with rotary tables.

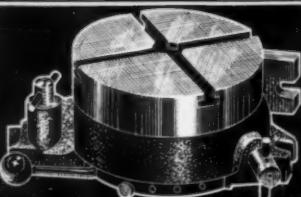
The machine is pneumatically tensioned.

Other features include positive manual or automatic belt tracking, micrometer grind pressure adjustment, vee-belt drive to permit abrasive belt

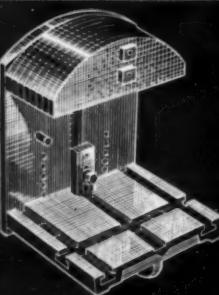
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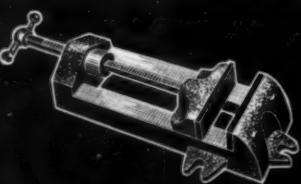
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Miniature Parts Header Has Variable Speed Drive

REM Sales Inc. has announced the availability of an improved Model 00

solid-die double-stroke cold header for miniature parts. The major design change consists of a variable speed drive arrangement allowing speed adjustment while the machine is in operation. By simply turning a hand dial, fly wheel speed can be adjusted between 150 and 300 rpm, thus permitting the operator to gradually tune in to maximum practical operating speed after a job is set up.

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The cold header is built into a desk-type cabinet base having tool storage drawers and work receiving pans. The motor drive is housed in the cabinet. The machine is provided with a one shot lubricating system.

Having wire diameter capacity from .012" to .070", it was developed for the manufacture of tiny components

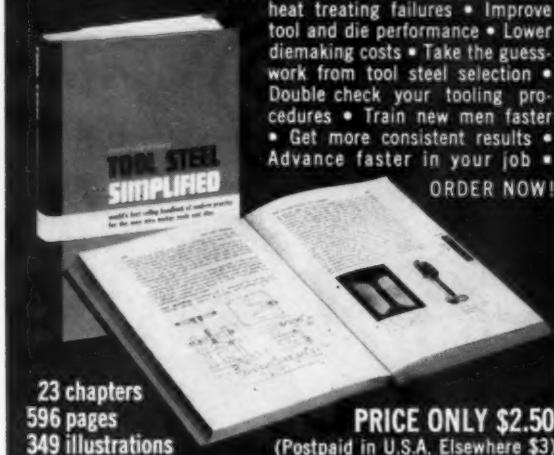
such as electrical contacts, optical screw blanks, and other miniature rivet forms. A special die block and mechanism included with the standard equipment allows deep hollowing of rivet shanks in soft materials such as aluminum or fine silver.

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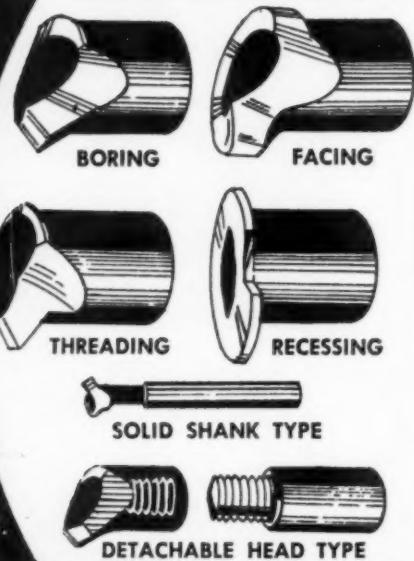
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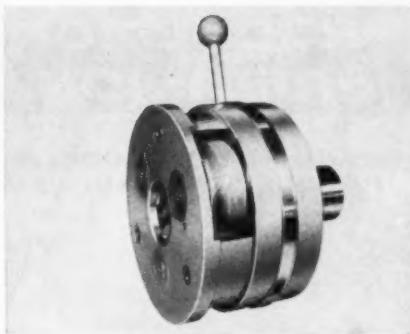
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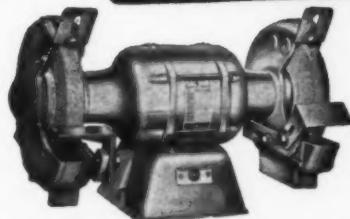
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Thread Rolling Head

A 2" thread rolling head has been designed by Landis Machine Co. to thread roll diameters from 1 $\frac{1}{4}$ " to 2". This No. 16 head, available in both stationary and revolving models, is self-opening in operation. The stationary head is opened by interrupting the forward travel of the turret or carriage, while the revolving head is opened by interrupting the forward travel of the yoke. Closing the stationary head is done by a reset handle, while the



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revolving head is closed by a yoke.

In operation, the use of lead screw, cam, or positive feed with these heads is not recommended. The necessary leading action is developed by the thread rolls mounted on roll shafts inclined to the proper helix angle. The roll shafts are inclined through replaceable helix angle bushings.

The same head can be used for right or left hand threads simply by using right and left hand bushing sets.

Landis Machine Co., Waynesboro, Pa.

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Lightweight Plasma Gun

A compact, lightweight plasma gun, which is only 5" long and weighs 3½ lbs., has been developed by the Avco Corp. The entire gun assembles with only four bolts. It will spray coatings, including refractories, with a controlled thickness, density, and bond strength. The gun can also be used to fabricate free-standing forms.

This model has integral adjustable cathode control. High regulation of powder feed by an electromechanical

GRAND RAPIDS

system permits the use of powders that previously were too fine for plasma guns, it is claimed.

Avco Corp., Research and Advanced Development Division, 201 Lowell St., Wilmington, Mass.

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Microscope Checks Die Wear

Bausch & Lomb Inc. has developed a microscope to quickly determine the exact amount of metal which must be ground away from a die to properly resharpen the cutting edge.

Although compact in design (it can be either hand-held or supported on its own base), the instrument is capable of measuring die-wear over a range of .020" to an accuracy of .0005", or 10% of the depth, whichever is greater. It can also be used for measuring bevels, burrs, and fillets.

A hardened and ground guide at the front contacts the die edge to be measured, automatically positioning the microscope for best viewing.

Bausch & Lomb Inc., Rochester 2, New York.

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Federal-Warco Division, McKay Machine Co., Warren, Ohio.

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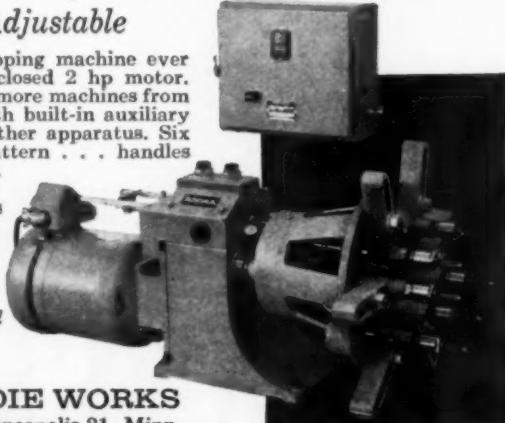
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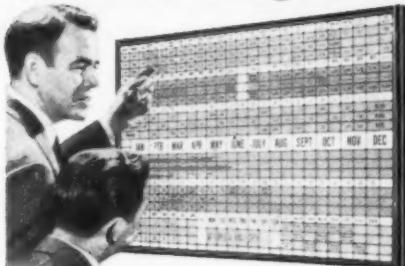
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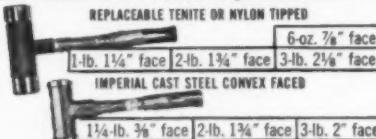
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Gresen Mfg. Co., 405-35th Ave., N.E., Minneapolis 18, Minn.

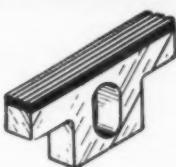
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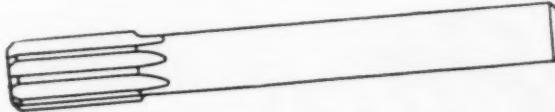
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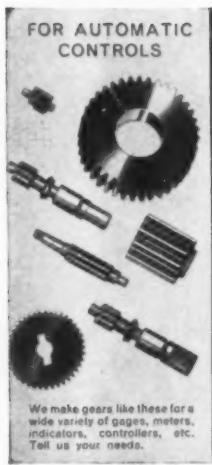
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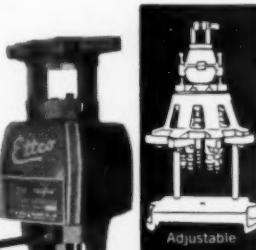
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5" Diameter

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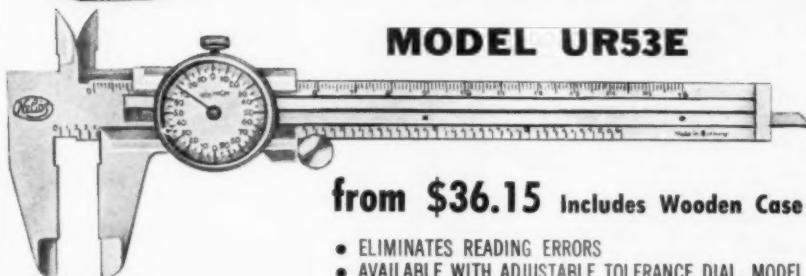
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addition to the usual dial indicator.

The strobe scale is placed just under the dial indicator window and provides roundness error reading by means of the length of a neon light. Reading subdivisions can be calibrated as small as .000025".

Electro-Autosizing Machine Corp.,
 7 William St., Closter, N.J.

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Conveyored Soldering Furnace

A conveyorized soldering furnace, available from K. H. Huppert Co., is especially adaptable for automatic soldering of small electrical and electronic components, but can also be used in almost any operation requiring uniform soldered connections.

It has three types overlapping zones of temperature control, for a total heating length of 9'. Heating elements are made of $\frac{1}{4}$ " Kanthal rod.

The soldering unit is encased in stainless steel with a three-section removable top. Power transformers, con-

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FLANGING MACHINES and CIRCLE SHEARS

- No. 1** 10 Ga. Circle Shear and Flanger.
- No. 3** $\frac{1}{4}$ " Cap. Flanger for flat heads.
- No. 4** $\frac{3}{8}$ " Cap. Flanger for flat and dished heads.
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- No. 7** $\frac{3}{4}$ " Cap. Flanger for flat and dished heads.
- No. 60** $\frac{3}{8}$ " capacity circle shear with a 23" throat.
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Shown is Model No. 56 Elliptical Head Shear and Flanging Machine which operates from the same controls. Head is sheared to size and shape before flanging from same template without removing work from the machine.

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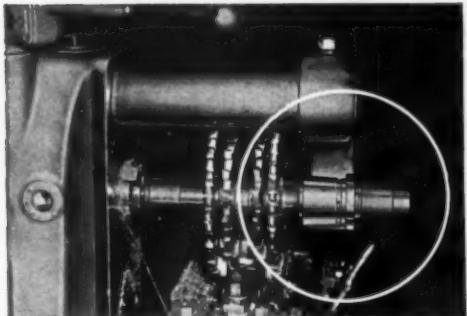
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Installed in minutes without machine rework. Requires no extra space; no adjustments. Extra sets of bushings provided to accommodate different size arbors. Permits full range of speeds and feeds of late model milling machines. Carbide cutters can be fully utilized.

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TOOL & MFG. CO.
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October, 1961

269

Mold your own LEAD HAMMERS

Here's the inexpensive, fast way of molding and remolding your own lead hammers with this COOK mold and ladle. It produces hammers that can "take it". Simple to operate.



COMPLETE
LEAD HAMMER
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tractors, and other electricals are mounted in the base, and the instrument control panel is located at the top.

K. H. Huppert Co., Dept. MB-3, 6840 Cottage Grove Ave., Chicago 37, Ill.

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Bearing Test Apparatus

A bearing test apparatus for measuring radial play in ball, roller, and self-aligning bearings is now available from Southwest Products Co. A spring pressure gage is provided to permit a constant pressure reading for each bearing. The gage registers in increments of .0001". Usage is applicable to all types of bearings where there is an inner and outer race.

It checks radial play in anti-friction bearings of 5mm bore to 38mm bore

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TAPER PINS

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Special sizes to order.
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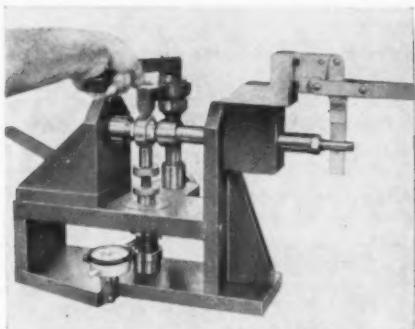
AUTO MOULDING & MFG. CO.
1110 E. 87TH ST.
CHICAGO 19, ILL.

SPECIFICATIONS

Open width $\frac{7}{8}$ " to 6"
Gage Material .040 to .187"
Pin Diameter .093" to $\frac{1}{2}$ "
Lengths to 120".

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MACHINE and TOOL BLUE BOOK



and other models to 153mm bore. It handles self-aligning bearings in a size range from $\frac{1}{8}$ " bore to $1\frac{1}{2}$ " bore and other models to 6" bore.

It measures 14" long by 12" wide by $12\frac{1}{2}$ " high and is suitable for bench use in quality control inspection.

Southwest Products Co., 1705 S. Mountain Ave., Monrovia, Calif.

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BORING BAR

by
MODERN

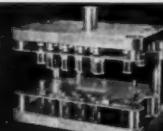
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Scientifically designed to diminish vibration in boring, the MODERN boring bar has various size holes drilled from each end to minimize harmonic vibration. Hole diameters were determined by using a VIBRATION METER and probing bar every $\frac{1}{4}$ ". The cavity is filled with shock absorbing material under vacuum, thus obtaining a dead bar of superior strength.

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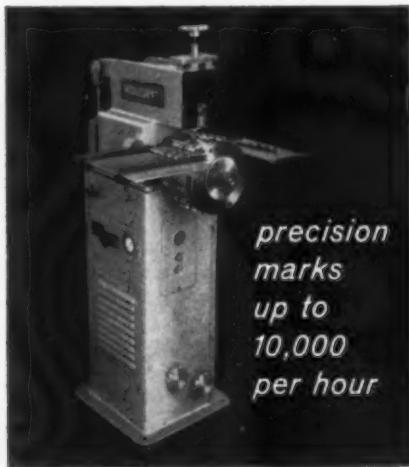
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*precision
marks
up to
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For marking drills, rods, and similar shaped work pieces, this Series 19 Model 562 Vertical Dial Roll Marking Machine is unsurpassed for capacity, ease of operation, quality of marking. Marks permanently indented impressions. Features include air loaded marking head, and universal carrier dial to accommodate parts from 1/16" to 1/2" diameter. Other models for every marking requirement. Write for literature.

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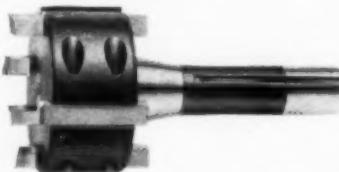
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272

Fly Bar With Radial Steps

Lido Tools has introduced a fly bar which accommodates four ordinary lathe cutting tools. Radial steps in which the tools are positioned produce four small chips instead of one large one, thus eliminating vibration and excessive spindle wear.



Setup time is reduced and standard tools can be sharpened by free-hand.

The fly bar is available with a shank having a No. 40 taper, No. 9 B&S, and R-8, with $\frac{3}{8}$ " wide slots to accommodate the tools.

Lido Tools, 1972 Placentia, P.O. Box 403, Costa Mesa, Calif.

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**Oldest Thor Power
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\$100 REWARD!

Thor will pay a reward of \$100 for information leading to the location of the OLDEST THOR POWER SCREWDRIVER STILL IN SERVICE (Air or Electric). Submit Model Number, Serial Number, Application. Write: J. L. MacDonald, Training Director, Dept. 16, Thor Power Tool Co., Aurora, Ill.

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MACHINE and TOOL BLUE BOOK

JIG BORING MACHINE accuracy to tenths on the new



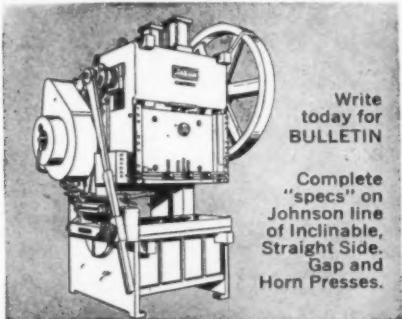
MODEL 1A **LINLEY** JIG BORER

Now, at moderate cost, a versatile, precision jig boring machine for small and large shops. Guaranteed lead screw accuracy to .0001 over the entire range. Designed for tool, die and model work; small precision jobs. New accessories add to its usefulness. Send for details.

Table Size: 7" x 17 1/2"
Table Travel: 6 1/2" x 10"

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October, 1961



NEW LINCOLN 225-AMP WELDER PERFECT FOR SMALL SHOP!

Here's a welder that can save time and earn dollars for you. With it you can do just about everything—weld mild and stainless steels, cast iron; braze; solder; thaw frozen pipes; hardsurface. Full 225-amp output lets you handle large $\frac{3}{8}$ " electrodes, big jobs, fast. It helps you hustle work through your shop quickly and efficiently.

Only Lincoln makes this welder which sells for less than \$200 and which will burn $\frac{3}{16}$ " electrodes. Costs less than many 180-amp welders.

WANT DETAILS?

Send for new bulletin No. 4610.1. Describes machine and accessories, production and repair uses. Write today. The Lincoln Electric Company, Dept. 2141, Cleveland 17, Ohio.



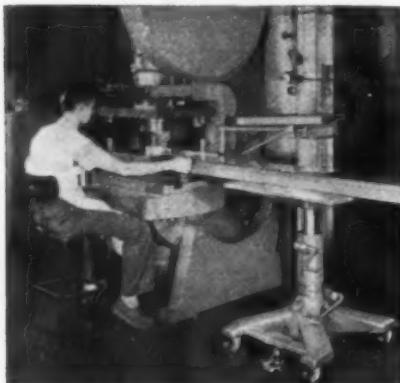
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(Eliminates Cranking)



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**A precision made
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Costs no more!**

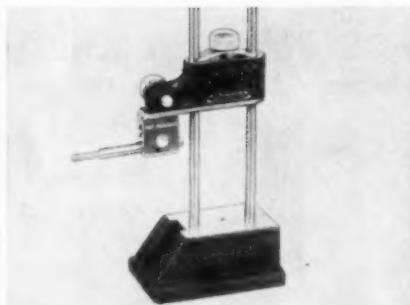
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- ✓ Floor clamping available extra

Write today . . . specials on request

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Surface Gage

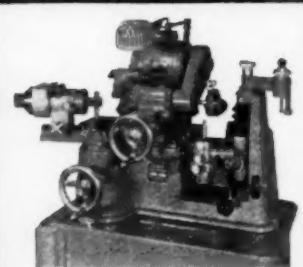
The Magic City Machine & Tool Co. has added a surface gage, called the Hi-Dicator, that has a chrome plated and lapped base, double bar elevation standards, and a no-backlash, instant-locking indicator holding assembly.

Primarily a comparison surface gage, it can be made with gage block or inside micrometer insertions.

Magic City Machine & Tool Co., 817 E. Charles St., Muncie, Ind.

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Sharpens Chamfers, Flutes,
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All materials in spray kit—
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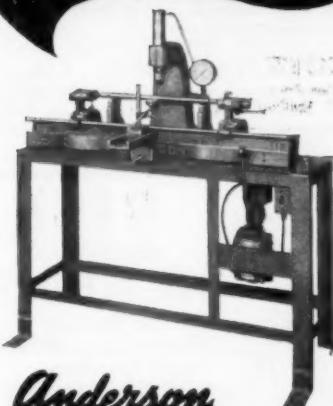
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October, 1961

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Increases Plant Production

Anderson power presses have solved the problem of manufacturers with straightening, checking, and truing operations that require more than ordinary speed and accuracy.

One plant, for example, showed an increase from (6 to 10) to (30 to 40) by using the Anderson Model HP-004 P 4 ton press shown above.

The full range of Anderson presses (4 to 50 tons) will help you profit from low-cost, high production precision straightening.

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**ANDERSON BROS.
MFG. CO.
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275

**BALANCED
ALLOY LEAD HAMMERS**



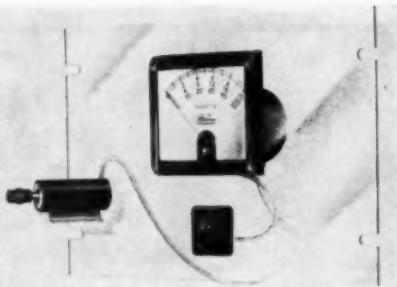
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1, 1½, 2½ and 5 lb. sizes—order your alloy lead hammer requirements from your mill supply house.
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Ranges**

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DIE FILERS**

The Complete
Die-Making Machines
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**FILING — SAWING
LAPPING**



- Work table tilts 4 ways
- 11", 13" and 18" table sizes
- Choice of 2 or 4 speeds or infinitely variable, 100 to 475
- Improved overarms
- You can dial correct speed and stroke with Model FS-VSS

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226 PARK AVE., BELGIUM, WISCONSIN
In Milwaukee's Great Industrial Area

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**21
MAGNETIC
TOOLS**

Magnetic
Base
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II
Permanent
Magnets—
Various
Sizes
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Indicator Holder — ¼" dia. non-magnetic stainless steel rod complete with 5/16" and 3/8" O.D. bushings. Fine precision adjustment identical to surface gage. Hardened ball socket setting permits universal positioning. Powerful 50-lb. pull magnetic base insures firm grip on any ferrous surfaces curved or flat.

Model 200B-\$6.95

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Horizontal motion is 360 degrees; vertical motion, 120 degrees. Fitted with vernier scale reading to 5 minutes.

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Drilling, Milling, Planing, Shaping, Grinding**

With a Boston Universal Angle Plate on the job, work is quickly set up on the table and but a few seconds are required to locate it at the desired angle. Indispensable in tool rooms and extremely useful in production runs, the Boston Universal pays for itself many times over by eliminating the necessity of expensive jigs and fixtures.

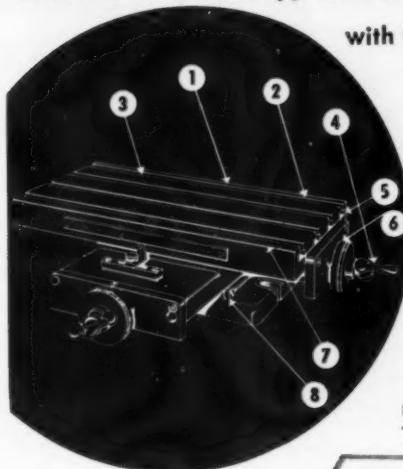
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COOK PRECISION *Cross Slide Table*

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8. Locking device eliminates chance of table moving

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HOUSTON GRINDING & MFG. CO., Inc.

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ARROW "QUICK-LOK" COLLET VISE

LOW COST FIXTURE!

A Quick Set-Up For Drilling, Tapping, Milling Using Standard Collets. Uses 3C, 1A & SC Collets \$29.50 to \$62.50.



MODEL 3A



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Install it in your shop. Its low cost will amaze you. Watch it pay for itself. You can quickly eliminate costly production tie-ups caused by waiting for expensive outside services. This is not an ordinary keyseater.

The Morrison Keyseater is quality built with machine tool accuracy. Practically anyone can operate it. It has automatic feed, automatic stop to cut off feed at given depth, automatic relief to back the work away from cutters, automatic lubrication. NO BUSHINGS REQUIRED. Cuts keyways $1/16''$ to $1''$. FREE new catalog 714-A shows all features and specifications, can be had by writing:



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**THE D. C.
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Cincinnati 1, Ohio

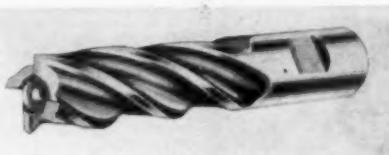
indicator unit, thus allowing this tachometer to be used on elevators, conveyors, or other materials-handling equipment.

Metron Instrument Co., 5300 S. Delaware, Littleton, Colo.

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End Mills

Quality Tool Works announces a complete line of high-speed steel Gold Label mills. Sizes range from $1/16''$ to



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Popular package
8-oz. can fitted
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holding soft-hair
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at bench; metal surface
ready for layout in a few min-
utes. The dark blue background
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Increases efficiency and accuracy.

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MACHINE and TOOL BLUE BOOK

HUPPERT

Floor Model Furnaces

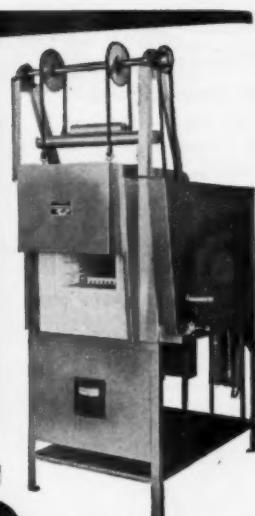
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- Continuous operation to 1850°F.—intermittent to 1950°F.—for 2300°F. on special order.
- Complete with indicating electronic controller.
- Tight-sealing, wedge-type door.
- Standard for 220 V. AC, single or 3 phase operation—110 V. or 440 V. on special order.
- Multi-insulation for maximum efficiency.

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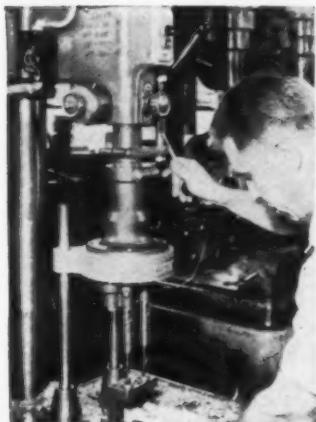
Model No. 16 Illustrated

K. H. HUPPERT CO.
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6845 Cottage Grove Ave., Chicago 37, Illinois



Inside Dimensions
12" W. x 8" H. x 18" D.
\$1050.00 complete

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Write for
Production Tool Catalog.

MULTI-DRILL

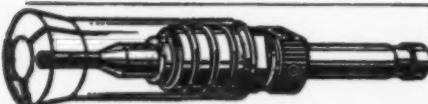
makes holes at a PROFIT!

This Model 600 MULTI-DRILL—an adjustable multiple spindle drill press attachment—fitted with optional Guide Rods, is drilling two 1/2" holes in a work piece at every stroke of the drill press—and is reducing hole costs to the basic minimum. The same unit is used on three other set-ups to drill holes ranging from 3/32" dia. to 5/8". Quickly adjustable spindles and heavy duty construction make this MULTI-DRILL a versatile time and money saving production tool that pays for itself many times over. Ask your nearby Commander Distributor to show you how a MULTI-DRILL can help solve your multiple spindle drilling problems. There's a model and size for any application or drill press.



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A matched set of transfer punches
for toolmakers, machinists & tool cribs

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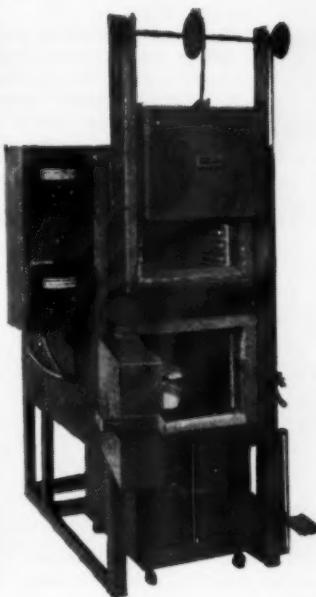
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October, 1961



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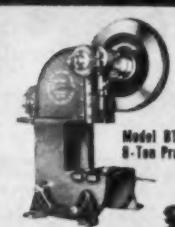
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October, 1961

151A

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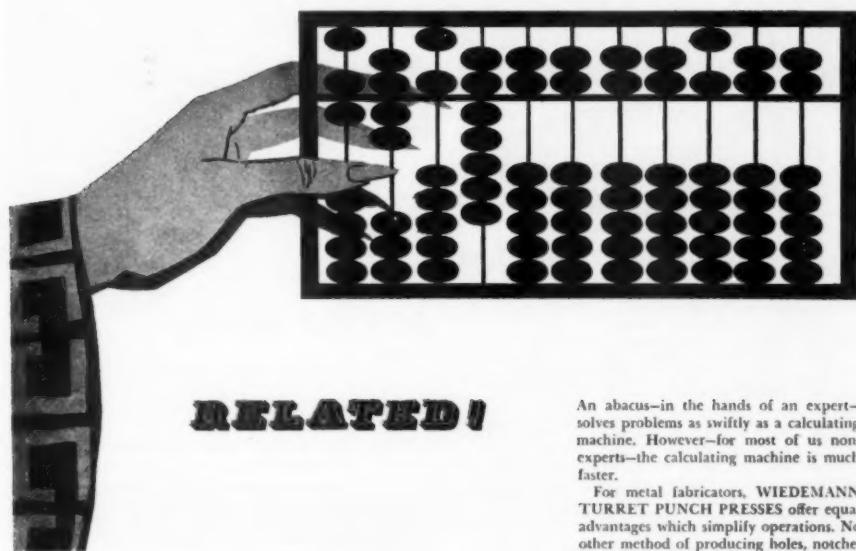
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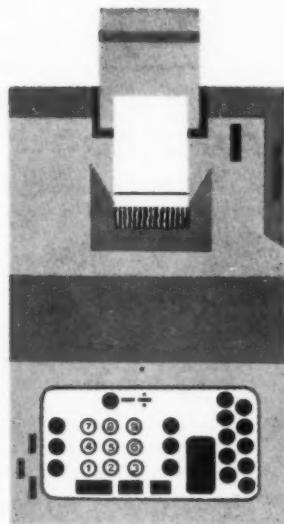
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MACHINE and TOOL BLUE BOOK



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October, 1961

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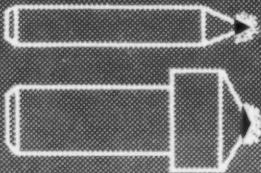
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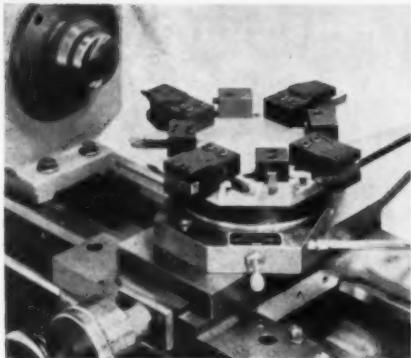
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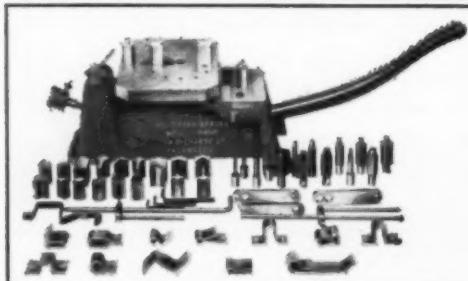
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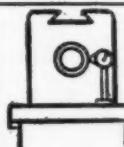
Rotor Tool Co., 26300 Lakeland Blvd., Cleveland, Ohio.

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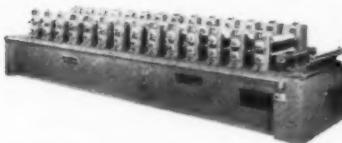
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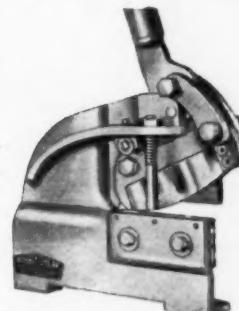
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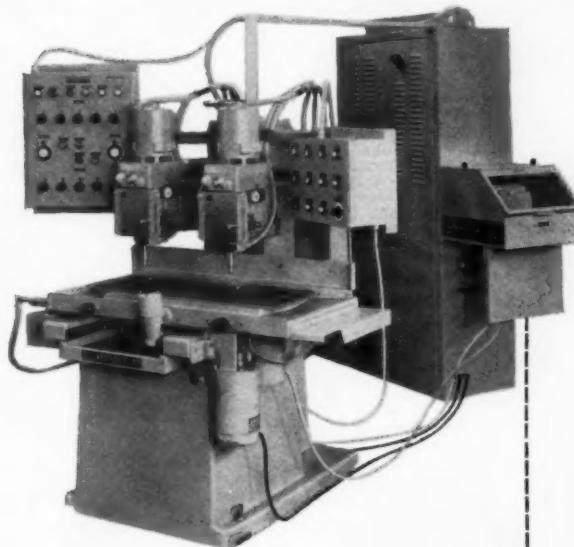
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- Table position and spindle cycle actuated by G. E. Mark II Numerical Control with fast tape reader.
- Operates in excess of 50 hits per spindle per minute.
- Drills single boards or stacks.
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- High speed positioning by self-contained, closed loop, hydraulic circuits and reversible G. E. Thy-Mo-Trol controlled motor driven pump.
- Nation-wide control service available from General Electric Co.

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Repeatability.....	± .0005"
Table size.....	to suit requirements
Table travel.....	Standard 11" x 15" Optional 19" x 15"
Overhang.....	14", Optional up to 22"
Spindle nose to table.....	Maximum 10" Minimum 0
Available stroke.....	up to 4 3/8"
Feed rate.....	infinitely adjustable
Geared spindle speeds.....	500 Minimum to 7500 Maximum or 1000 Minimum to 15,000 Maximum
Floor space required.....	Machine 60" x 50" Control cabinet 94" x 47"

*Subject to change. Dimensions are approximate.

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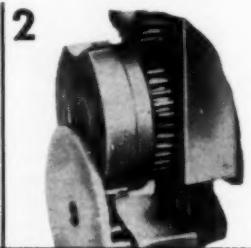
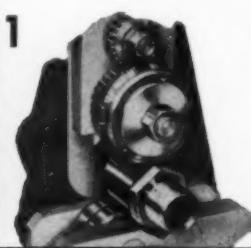
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	2	1.72		2	2.96		1	4.72			
	2-1/2	1.96		2-1/2	3.55		1-1/4	5.43			
	3	2.30		3	4.27		1-1/2	6.14			
	4	3.22		4	5.76		2	7.31			
	5	4.51		5	7.31		2-1/2	8.64			
1/8	6	6.18		6	8.93		3	10.06			
	1/8	1.66					4	12.53			
	1/2	1.04	5/16	1/2	2.05		5	16.03			
	3/4	1.21		3/4	2.23		6	18.41			
	1	1.30		1	2.51						
	1-1/4	1.46		1-1/4	2.74		3/4	4.22			
	1-1/2	1.54		1-1/2	2.96		1	5.06			
	2	1.80		2	3.50		1-1/2	6.84			
	2-1/2	2.05		2-1/2	4.27		2	8.51			
	3	2.46		3	5.01		3	11.61			
	4	3.29		4	6.55	3/4	4	15.49			
	5	4.60		5	8.60		5	19.08			
	6	6.52		6	9.89		6	20.83			

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ONE LAST WORD

Modernization or Continuing Improvement.... It's the Same Thing

Modernization is too often considered as merely repulsively costly pills to be taken by the handful when sickness strikes or as a result of a snake bite. Usually it is not considered as a continuing program but a separate and monumental project; not as a way of business but as a last resort measure; not as a part of our scheme like production, engineering and sales but as an undertaking which is aloof from the day-to-day operations and is labeled and boxed with such High Policy matters as Mergers, Foreign Operations and Acquisitions.

In too many minds Modernization and Much Money go hand in hand and thus are best left to the huge steel, electrical and automobile complexes who can afford (?) to spend hundreds of millions of dollars. The very word Modernization frightens the average business man, causing the blood to leave his face. And yet, what exactly is Modernization if it isn't Continuing Improvement on a day-by-day basis

in every department, at every level from top to bottom?

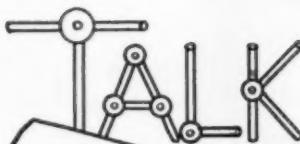
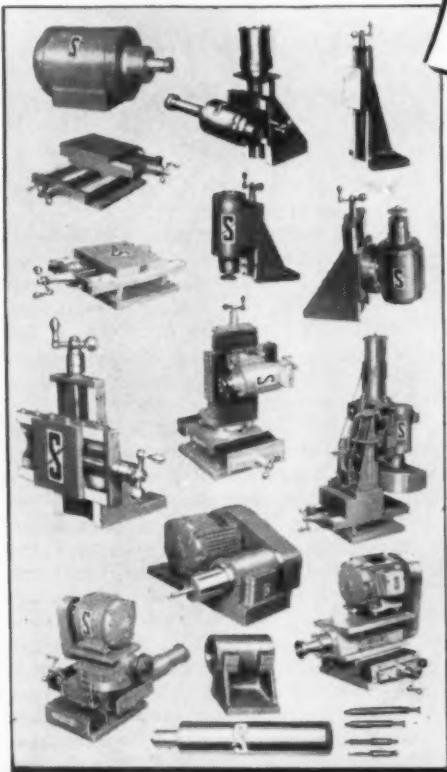
What really is the point of Modernization or Improvement if not to reduce the cost of manufacturing, increase productivity, raise profit levels, and increase the salability of products? Are we not basically trying to manufacture better and more economically for a more favorable profit picture?

One last aspect of this problem must be tackled: Is Modernization or Continuing Improvement necessary? No, it isn't, for the man who wants to go out of business, for the man who wants to stop growing, for the man who likes a reduced income, for the tired man who is afraid of his responsibilities and will sell the joint to a go-getting competitor. But it is a life and death matter to the American businessman who needs to grow and improve his profit position, for the American who sees farther than his immediate shop and realizes that his is part of America's growth and future and America's strength.

Wm. F. Schleicher
Publisher



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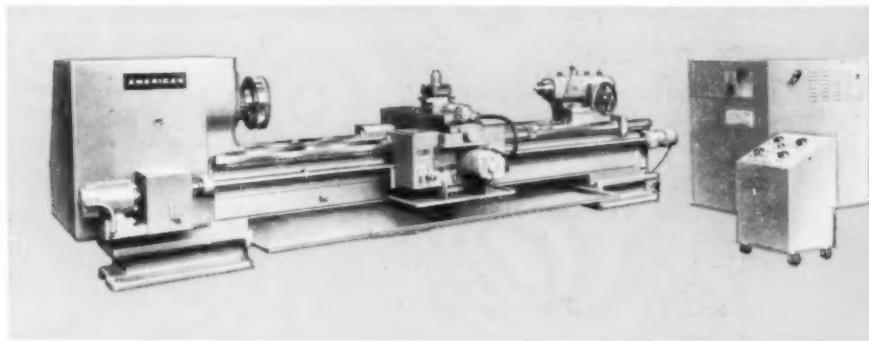
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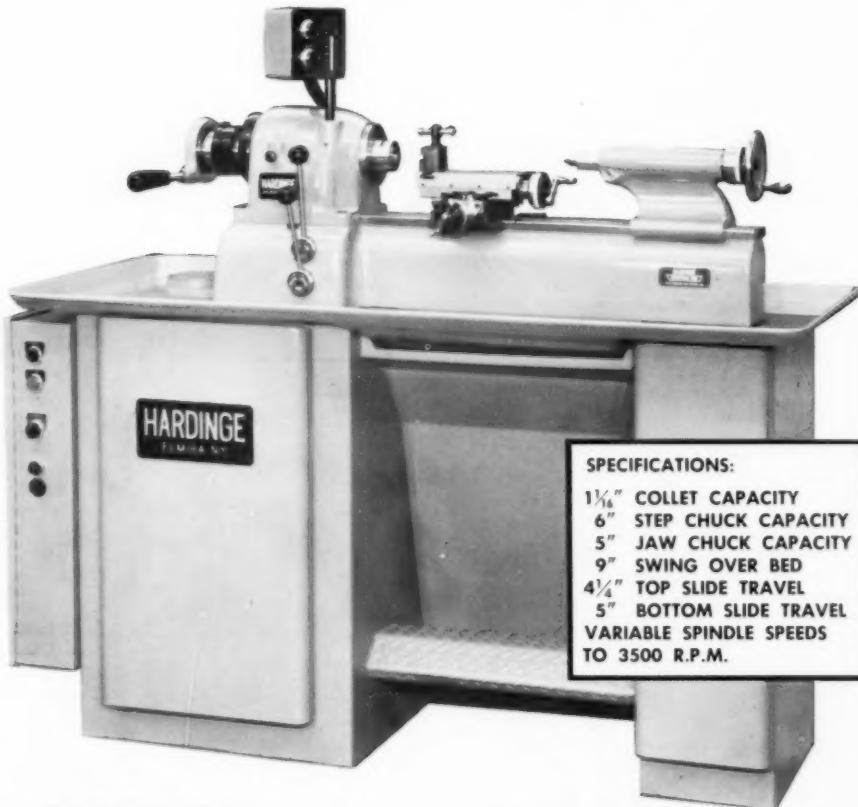


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